ARCHIVES OF
PHYSICAL THERAPY, X-RAY
RADIUM

VOL. IX DECEMBER, 1928 No. 12

TREATMENT OF TUMORS OF THE BLADDER BY SURGICAL DIATHERMY*

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DES MOINES

The purpose of this communication is to present an unbiased appraisal as to the value of surgical diathermy in the management of tumors of the bladder. The information possessed by the writer regarding the efficacy of this physical means in the treatment of tumors of the bladder has been acquired from many sources; however, the conclusions upon which this paper is based have been derived from an analysis of fifteen cases which have come under my observation the past four years. It is not the intent of this paper that surgical diathermy should supplant the other well-known methods utilized in the treatment of tumors of the bladder at the present time. On the contrary, I firmly believe that every surgeon should be thoroughly conversant with all the recognized procedures that possess merit and be able to apply them as he sees fit.

As one scans the comprehensive literature of today on the management of tumors of the bladder, he is impressed with the varied opinions that are expressed. The futility of surgical excision in the treatment of tumors of the bladder can be best interpreted when the assertions of such eminent surgeons as Kelley, Kolischer, Corbus, Wyeth, Clark and Doyen are read. I quote verbatim a paragraph from an article by Dr. Howard A. Kelley as it appeared in one of our Journals:

"Surgery is the most aggressive procedure and the only one associated with serious risk. The limitations of surgery are at present, as in the past, due to the fact, with rare exceptions, that it is only applicable to isolated, pedunculated growths—the simplest growth under discussion—while it is worse than useless in carcinoma invading the bladder wall. It is difficult to see what will remain for the pure surgeon to employ his art except as an adjunct to radium or endothermy.

"We have felt quite a serious temptation to spend considerable time in developing another form of surgery. It is quite certain that any attempt to remove a tumor by means of forceps or knife exposes the patient to the risk of serious hemorrhage and should be eliminated."

On the other hand, however, such well known surgeons as Judd, Young, Scott, Squier and Chute have been much in favor of radical surgical methods in the treatment of tumors of the bladder, and most of them condemn the various conservative operative procedures. According to Judd; "Surgeons have

*Read at sixth annual meeting, American College of Physical Therapy, Chicago, Nov. 2, 1927.

been too ready to give up radical operations for malignant disease of the urinery bladder which is for a long time confined to the bladder and immediate tissues, and, therefore, pre-eminently suited to surgical treatment. Not all cases can be cured, but a higher proportion will be cured by radical surgical treatment than by any other method. Total cystectomy and implantation of the ureters into the rectum should be performed more often in cases of cancer of the bladder. Up to the present time the failures have been due to too conservative operative procedures and often to delay in operating on account of following some less radical plan first."

As to the value of the roentgen ray and radium in the therapy of tumors of the bladder considerable skepticism prevails. While there are on record histories of many cases that have been greatly benefitted by the use of x-ray and irradiation by radon seeds implanted through the cystoscope, yet the majority of urologists place very little faith in the curative properties of these physical agents.

The methods in vogue at the present time for producing destruction of tissues are by means of the various forms of cauteries. With this type of heat application, the heat is transmitted to the tissue by contact only. It is localized, first in the instrument, and secondarily radiated into the tissue.

The disadvantage of this method of heat application is the superficial character of heat distribution which is responsible for a condition termed carbonization. The carbonization which develops under these circumstances so insulates the tissues that further deep heat penetration is impeded. This factor alone is responsible for the many failures that occur when the cautery form of heat application is employed to produce destructive changes in neoplastic tissues.

The heat generated by the high frequency current differs greatly from that of the cautery because it is generated within the tissue by the resistance offered to the current during its passage. The superficial character of heat penetration does not occur here for the particular reason that the heat is first localized within the tissues themselves, and secondarily in the instrument. Carbonization can be eliminated if one is careful with the manipulation of the current strength. We, therefore, have in this latter method of heat generation one capable of causing the necessary deep heat penetration so essential for complete destruction of the cancer cells.

I consider diagnosis vastly important and feel that it is absolutely essential to stress some phases of it. There is a unanimity of opinion among the urologists of today that hematuria is usually the first symptom indicative of tumors of the bladder. Blood in the urine is never physiological; it is a symptom of some pathological condition. Seventy out of every hundred cases of painless hematuria are suffering from tumor of the bladder. It is my belief that hematuria of this particular character should be regarded as a serious condition, and its presence should demand a careful cystoscopic examination at the earliest possible moment. The symptomatic treatment of this cardinal symptom of tumor of

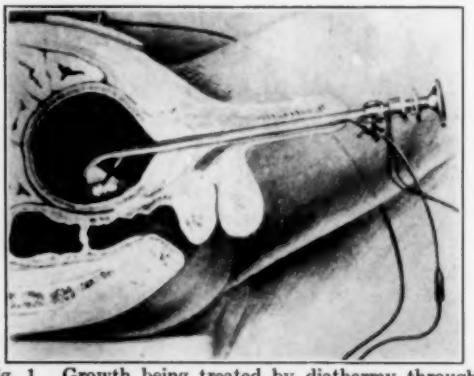

Fig. 1. Growth being treated by diathermy through a single concave-sheath cystoscope.

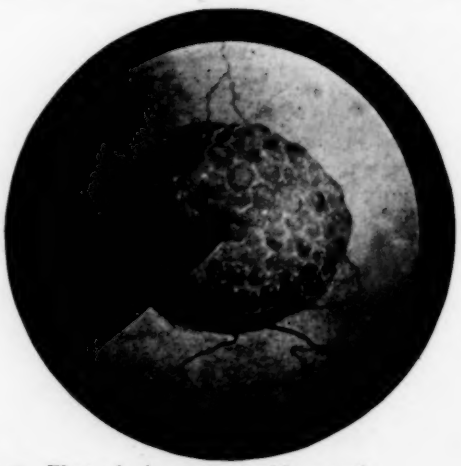

Fig. 2. Electrode in contact with growth.

the bladder simply lulls the patient into a sense of false security and delays, considerably, the chances of recovery from this serious malady.

I will now proceed to the result obtained with surgical diathermy in a series of fifteen cases studied over a period of four years. I also had under my care and observation other patients, but, because I have been unable to ascertain their present condition, they are not included in this report.

The following illustrated cases are cited:

Group I.

Two patients: ages 65 and 70 years respectively. Diagnosis: In each case malignant papillomata of the bladder, extensive in character, associated with hypertrophy of the prostate gland. Suprapubic cystotomy with electrocoagulation of growth was performed in each case. Later in both patients a prostatectomy was done. One patient was cystoscoped at intervals of every three months with no evidence of recurrence, enjoyed fairly good health following the operation and was symptomatically well; died two years later from an attack of myocarditis. The other patient was cystoscoped only once following operation, no evidence of recurrence, was apparently in good health on leaving the hospital, free from all symptoms; and two years later his physician reported his death from pneumonia.

Group II.

Two patients; both female, ages 70 and 75 respectively. Diagnosis: One multiple, infiltrating, malignant papillomata of the bladder, extensive in character; the other, a single sessile form of tumor. Suprapubic cystotomy with electrocoagulation of the growth was carried out in each case. One patient lived for a period of one year with comparative relief, cystoscoped a short time before her death, when a small recurrenc was noted. The second patient died three weeks following the operation as a result of renal insufficiency.

Group III.

Two patients: both male, ages 60 and 55 respectively. Diagnosis: One with a single papillary carcinoma of the bladder; the other an extensive multiple, malignant, infiltrating papilloma. Suprapubic cystotomy was performed on each patient, and the entire tumor bearing area destroyed by surgical diathermy. One patient left the hospital in three months with a Pezzer tube sutured in the bladder, was requested to report for further observation and treatment. A month later his physician reported his death from suicide. The second patient is still under my care and observation, apparently free from symptoms six months following operation.

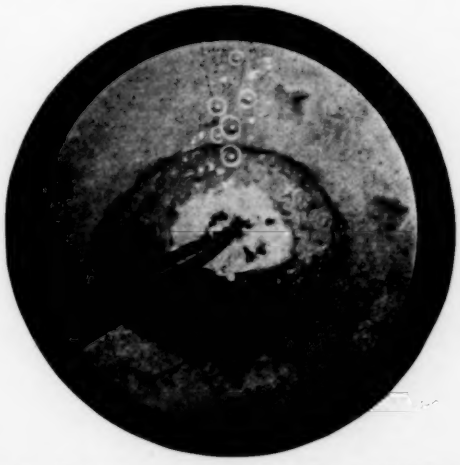

Fig. 3. Commencing application of diathermy to growth; bubbles of gas appearing in view. Figures 1, 2 and 3 are reproduced by permission and courtesy E. Canny Ryall.

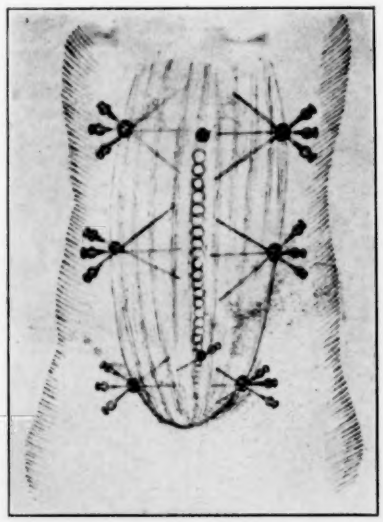

Fig. 4. Illustrates the method employed to produce regional anesthesia for abdominal field block.

Group IV.

In this group we have four patients, ages 45 to 67 years. Diagnosis: Papillomata, both benign and malignant in character. Electrocoagulation carried out by the open method in three cases and, one transurethral. One patient now living four years after operation; two patients, two years; one patient, a year, and the other patient, six months following operation. All patients in this group have been cystoscoped at various times and are free from their complaints with no evidence of recurrence.

Group V.

Five patients are included in this group, four male and one female; ages 30 to 50 years. Diagnosis: Single, benign papillomata observed in all; surgical diathermy, thransurethral, was performed in these cases. Up to the present time, two patients in this group have had recurrence, both were again treated by the same procedure with apparent relief. One patient is free from trouble three years following treatment; one, six months, and one two years after treatment.

SUMMARY

In summarizing the results in these fifteen cases, we find five patients deceased. Of this number, two lived for a period of two years free from symptoms; one lived a duration of one year with some degree af papillation; one, only a short period of three weeks; and one committed suicide soon after leaving the hospital. The remaining ten patients are living at the present time, apparently well.

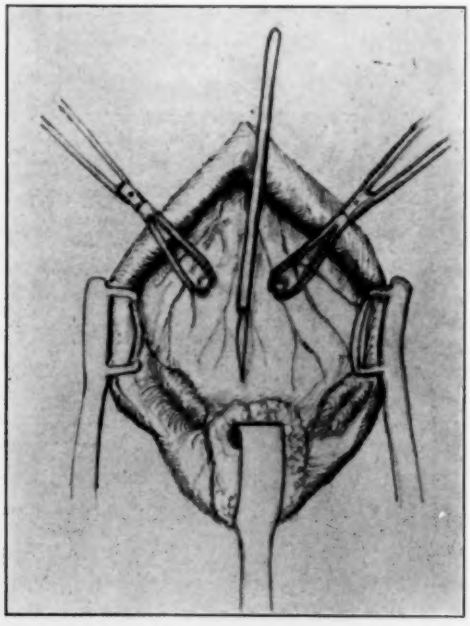

Fig. 5. Illustrates method employed in order to expose the anterior wall of bladder.

Before considering somewhat in detail the technic in the application of this electrothermic method, allow me to enumerate the essential requirements necessary for the successful accomplishment of this procedure.

First.—Accurate understanding of the basic fundamental principles of high frequency current.

Second—An intimate knowledge of the anatomy and pathology of the urological tract.

Third—Possession of a standard machine of the latest type.

Fourth—Skill and experience in the art of surgical technic.

Fifth—Careful preliminary preparation of the patient, particularly those in which the open operation is contemplated.

ANESTHESIA

Regional anesthesia is pre-eminently suited for this method of surgery, and in most of my cases this form of anesthetic is used. In the transurethral diathermic application, where the destruction of the tumor is carried out by means of cystoscopy, sacral anesthesia only is necessary.

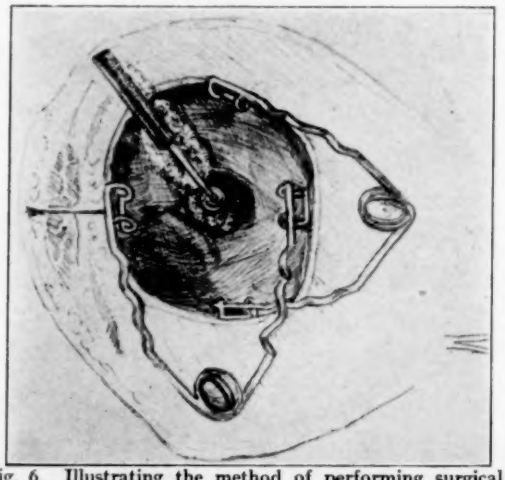

Fig. 6. Illustrating the method of performing surgical diathermy in tumors of the bladder by the open method.

Where the coagulation process is executed through a suprapubic cystotomy, sacral anesthesia together with an abdominal field block is utilized. In both methods, however, patients receive a preliminary hypodermic injection of a small dose of scopalamine and morphine.

TECHNIC OF TREATMENT IN THE TRANSURETHRAL METHOD

The inactive electrode is placed beneath the sacrum or over the bladder a few centimeters back of the symphysis. The active electrode consists of a flexible insulated bougie with a metal tip. The usual cystoscopy is carried out. The bougie is inserted through the sheath of the cystoscope and its distal end engaged firmly into the substance of the growth; the current is turned on very slowly and gradually increased, The appearance of a blanching tissue or a grayish color is an indication that sufficient coagulation has taken place in the area treated. This is repeated numerous times during the cystoscopic seance until most of the tumor area is covered. Three to four treatments of this character are frequently required, for the complete destruction of the tumor.

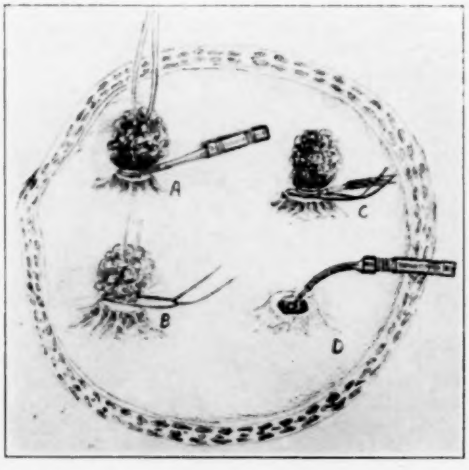

Fig. 7. Illustrating the method of removal of pedunculated tumors of the bladder by the endotherm knife.
(a) Demonstrates the knife encircling the base of the tumor.
(b) Transfixing the growth with heavy surgical ligature.
(c) Excising the tumor with the knife.
(d) Coagulation of the base of the tumor with a spheroid electrode after the removal of neoplasm.

TECHNIC OF TREATMENT IN THE OPEN METHOD

The indifferent electrode is placed beneath the sacrum in intimate contact with the surface of the body. The active electrode used in this method consists of various shaped and sized discs together with the so-called electrocoagulation knife. These electrodes are interchangeable and are attached to an insulated ebony holder. The selection of the active electrode is entirely dependent upon the character, accessibility and number of growths. If one is confronted with the pedunculated form, the tumor can be best removed with the electrocoagulation knife followed by a thorough coagulation of the base with a circular, button-shaped electrode. The first indication that proper coagulation has taken place is the blanching and steaming of the tissue, and when this occurs, the current is shut off and the electrode removed. This process is repeated until the entire tumor area is destroyed.

In brief, what then are the principle advantages to be gained by surgical diathermy in the management of neoplastic conditions of the bladder?

First—The tumor can be extirpated with a greater degree of conservatism because it is not necessary to remove much of the adjacent tissues.

Second—The tumor is removed in a necrotic state instead of a mass of viable cells. This is of considerable importance because it prevents, in a great measure, the development of metastasis elsewhere in the body.

Third—Infection is prevented because the region in which the treatment is carried out is

Fig. 8. Illustrating the method of producing destruction of a single bladder tumor by means of the Plank electrode.

rendered sterile as a result of the thermic properties of the current.

Fourth—Hemorrhage seldom occurs with this method for the reason that the blood vessels in the area treated are thrombosed; therefore, it can be made a bloodless procedure.

Fifth—Shock to the system is reduced to the minimum because the factors conducive to the development of shock are absent.

Sixth—This method lends itself best to local anesthesia, as the various inhalation anesthetics are contra-indicated, because of their inflammable properties.

CONCLUSION

In conclusion, I firmly believe that surgical diathermy as outlined in this communication is by all means the method par excellence for the treatment of neoplastic diseases of the bladder; and, in my opinion, is immeasurably superior to any other method in vogue at the present time. I would advise the members of the profession who are interested in the therapy of this important malady to acquaint themselves with this method in order that they may use it intelligently and thereby secure a maximum amount of benefit to the patient.

I here wish to acknowledge free use of the literature on this subject as indicated in the bibliography, and to express my thanks for the helpful suggestions in personal letters from Corbus, O'Connor, Morgan, Kolischer, Ward, Cunningham, Howard Kelly, Starr Judd and Canny Ryall.

DISCUSSION

DR. DISRAELI KOBAK (Chicago, Ill.): I have been an active participant in the method of surgical diathermy. I might say that I have been very familiar with the work of Dr. Kolischer, particularly. He has always an interesting point of view, and it is a point of view that covers usually the best in the literature on the subject. However, I might say that the idealistic state that Dr. Kolischer painted is the ideal toward which we all strive. It is peculiar that the quacks and the charlatans make greater use of the possibilities of serum, vaccines and other treatments in these conditions than the conservative. The danger is, of course, in the use of chemotherapeutic products. We owe the public a warning that charlatans are capitalizing on the use of serums and other impossible cures and we, ourselves, must also remember the limitations of treatment at the present time.

Hemostasis by the method which Dr. Ward illustrated is a very good one. I have also had experience with it and I want to pass its value on to you, as Dr. Ward has.

There is a point, however, that we must warn you of in operative procedure by surgical diathermy, and that is that all these malignancies cannot be delimited by this method, because we do not know the limitations of the malignant neoplasm. We may remove the neoplasm, but somehow or other, we are not able to remove the entire mass. If it is true as Dr. Kolischer theorizes, that it is not the complete removal of the neoplasm that makes for success, but possibly a stimulating force that you produce, that may be the reason why surgical diathermy has a field in these conditions.

I was very glad Dr. Ward brought out and illustrated the point of the cutting current in combination with the coagulation current. The last time I spoke to him in Washington, I was particularly interested to know whether he was using the cutting current or

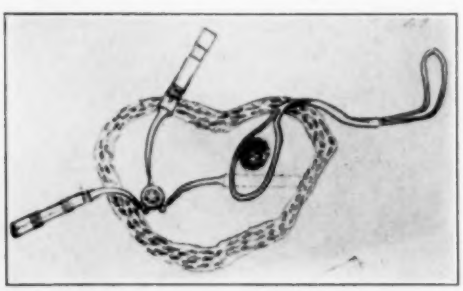

Fig. 9. Illustrates the process of circumvallation and method of retraction of bladder wall with a Barringer retractor.

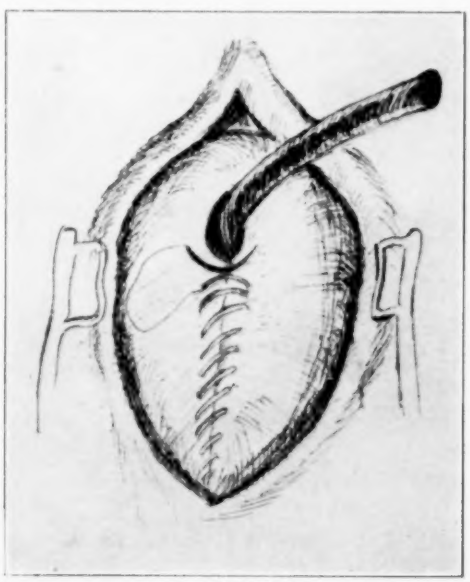

Fig. 10. Demonstrates the closure of bladder wall around the Pezzer at the upper angle incision.

a combination of the cutting current and the coagulating current. So far as I can see the coagulating current is sufficient for all purposes. You can just as easily remove the material afterwards either by a sharp curet or by the scissors. However, if one can easily change from the coagulating current to the cutting current, the combination may prove advantageous in the hands of some surgeons.

I might offer another point at the present time, that one can also actively operate with a scalpel and at the same time utilize surgical diathermy. That is by coupling to your operating hand a cuff connected with your diathermy apparatus, the other one connected underneath the patient, in that way forming a circuit. By making and breaking your foot switch you can introduce enough current through your scalpel so as to produce hemostatic effects on tissue or even coagulating effects on tissue.

I am somewhat worried about schematic drawings. There is a danger to that. For instance, as an example, the drawing of the tongue, or the mouth with the tongue, and the simplicity with which it was exposed and the effect of the operation. It is not quite as easy under usual measures. The drawing does not depict to you some of the difficulties in the procedure. This is really a surgical procedure to be utilized by experienced surgeons. One must know the anatomy, and one must have the background of surgical experience to utilize this very valuable adjunct to surgery.

Dr. A. David Willmoth (Louisville, Ky.): Remember that a cancer is always a systemic condition. There is always something in the patient's system that produces the growth. This brings the question to us that if you expect to do much for these patients you must not regard a local treatment as all of the treatment by any manner of means. That is simply treating the local manifestation. If you want to do anything for a cancer patient in the way of a cure, change his chemistry, change his surroundings, change his system. and then you will do more towards the cure than if you merely remove the growth and let him go back into his home. Isn't it logical and human and isn't that the thing that counts? Why operate on a woman and take off the breast and let her go back into the same home and eat the same things that produced the change in the chemistry that caused the rapid degeneration in the first place? The first speaker emphasized one of the most important things, and that is to recognize that cancer is a systemic condition. It is a thing we have to treat generally, and the sooner we come to that and the sooner we give our patients more attention in that way, the quicker will we get to the place where we will get better results and more lasting cures in the relief of this dreadful malady.

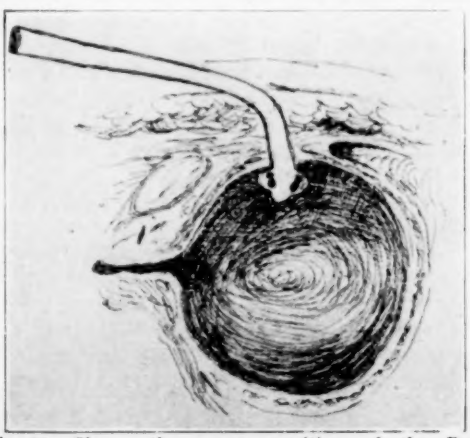

Fig. 11. Shows the proper position of the Pezzer catheter in the bladder incision.

How do we know that when we remove a local growth and it recurs within two or three years that it isn't the second growth? Isn't it perfectly logical that the thing that produced the first one could produce another one We say it is metastasis. That is the logical reasoning of course at the present time, but you can't prove it. It may be a second new growth.

There have been numbers of questions brought up tonight that are worthy of extensive consideration because this is a very important subject. I have never yet brought myself to the place where I believe that the so-called endothermic knife has any great advantages in a large number of cases. I think it does have a field, but the trouble with the knife is its carbonizing effect on the fat. It is easy to cut muscle and if you watch all of the demonstrators they always use a piece of beef. Beef is easy to cut, but the trouble comes in the carbonization of the fat, and the trouble that follows is the reason why I have never yet taken to the knife as an instrument to do extensive work with. It has a field, but in my judgment it is a limited field.

Tumors of the bladder. I want to just speak on one point and that is first the classification of the tumors and the next is the treatment of them. I notice most of the doctor's illustrations were on open operations. Let me insist to you that when you are dealing with a tumor of the bladder, don't do it through the cystoscope. Would you want to fight a badger in a hollow log? You certainly would not. You say it is benign. How do you know it is? Most are malignant. Deal with it scientifically and under your eyes and you will have better results than you will trying to work through a little cystoscope.

Dr. Bucky (New York): I am certainly aware of the honor to speak to you this evening. I have only a few little points to add. First of all what Dr. Kobak said was very illuminating. All the other papers were, too, but he is entirely right when he says that with the name *diathermy* we shouldn't combine the impression that the heat really goes through and through the body.

On the other hand, it is very interesting that besides the heat which is produced with diathermy there may be another agent combined with it. We don't know very much of it yet. But if, for instance, you have, let us say, a neuritis, it very often happens that the pain stops immediately with the diathermy treatment. The patient may not have felt heat. That shows you we shouldn't pay too much attention to the heat. On

the other hand, it should be understood that no other heat method can accomplish what diathermy does as far as the kidney is concerned. Eserline's work was done scientifically and thoroughly. He measured the temperature of the skin when different methods of heat were applied. He found that, for instance, with any kind of heat applied besides the diathermy, skin will always have the same temperature of 37 degrees centigrade. With diathermy you can really see the heating up of the skin.

There is one additional point I want to emphasize and that is the method of general diathermy which really heats up the entire body. It is easy to measure temperature of the body and you can see you have an increase of temperature of one degree or one and one-half or two degrees. That is really also heating up of the internal organs in comparison with the local application where the heat doesn't penetrate very much.

One of the speakers mentioned the odor combined with the tumors. There is a very nice method to get rid of the odor for about twenty-four hours if you apply the condensor electrode of diathermy. You go slightly over the area. The smell stops almost immediately.

Dr. Gustavus M. Blech (Chicago): I think the discussion this evening, as far as I see it, centers around two things. In the first place we are running, with the various physical methods, into the same dangers and the same experiences that any new specialized branch of work has experienced. The urologist's work was very limited in scope until they developed urological surgery as a science. They had a struggle to get recognition as specialists. I recall just a few years ago when I stood in the Chicago Medical Society and heard a most distinguished surgeon denounce the proctologist as trying to build up a specialty on a specialty. The question of specialization of diathermy, medical and surgical, and all the other physical agents which Dr. Kobak mentioned in his address, is a question of time, question of accumulation of facts, question of the development of scientific literature, which no amount of politics, no amount of oratory, no amount of advertising, will bring up to the dignity of a specialty, unless it develops so itself.

With reference to the technical papers this evening, Dr. Kolischer of course stirred up a hornet's nest by coming out with his usual brilliancy of speech, but he has practically and frankly said to you, "we don't know what cancer is," and I agree with him. We don't know what cancer is, we don't know its etiology; we probably will know it within the next few hundred years through the work of scientists. We can talk about cells and all the research that has been done. We have only learned one thing, how not to experiment wrongly, because we know how experiments have been wrong. One of the most distinguished German scientists, Cherney of Heidelberg, gave up the chair of surgery in order to devote himself entirely to research in the problem of cancer. He has said the best he has done in his life was to show paths which should not be trodden again. That is achievement. Today we are not any further. Under the circumstances the endotherm knife or the electrocoagulation instrument does, in a rough way, but in a more secure way, exactly what a knife does. We are still passively going after it. That is all the means we have at present. I want to warn you that this is not the panacea for the thing. Diathermy is not going to replace the knife. Only a few days ago I had the misfortune of seeing a young woman operated on elsewhere by the knife. The surgeon cut a very important blood vessel in the axilla and the woman has no circulation. Had this man operated partly with the diathermy knife and partly with the surgical knife and dissected properly, he would have avoided that accident.

Therefore, until the perfect technic is developed, until the instrument is so finely adjusted that you can control with your fingers every millimeter of progress in detecting any success with the knife, until then, go very slowly with surgical diathermy.

Dr. G. P. Lawrence (Westerville, Ohio): Dr. Kolischer and Dr. Willmoth, in their papers and discussions, have stressed their belief that cancer is due to some alteration in the body chemistry. As a general practitioner the impression has been growing in my mind over the past several years that most of the ills which come before me for treatment, or at least a very large majority of them, are fundamentally and basically due to errors in diet and living habits, especially to the modern fad of denatured foods, introducing certain vitamin deficiency and salt deficiency, and so forth.

It occurs to me to suggest that in attacking this cancer problem to keep in mind that perhaps this alteration of body chemistry is fundamentally caused by this modern denaturized food causing the above mentioned lack of vitamins and salts.

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PHYSICAL THERAPY IN THE UNDERGRADUATE MEDICAL SCHOOL CURRICULUM*

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Physical therapy in the present medical curriculum varies with each school both in time and method of instruction. This is exemplified in Chicago, where four Class "A" medical institutions offer instruction in physical therapy. No two are in accord as to the length of time necessary for a thorough exposition of the fundamentals of the course, nor as to the method of clinical presentation. This condition no doubt reflects the present status in the teaching of physical therapy for undergraduates throughout the entire country.

The reason for this situation can broadly be attributed first, to a healthy state of intellectual independence amongst the faculty members of each school, second, to a lack of teaching traditions in this new subject in orthodox medicine, and third, to an accommodation by an already overcrowded curriculum to a fairly new and comparatively unfamiliar form of therapy. Physical therapy is still accepted with reserve and divided enthusiasm by the faculties of the various medical institutions, and this in spite of accumulated and favorable evidence of its value. This is due as much to lack of familiarity with the agencies utilized as to the fact that they have in the past shifted to the lowest strata of medical practice.

The perplexing situation as it exists today in the majority of the schools is not fundamentally due to prejudice on the part of the faculties, but rather to the fact that the teaching program is already overcrowded or top-heavy. The instructors of physical therapy have therefore the choice of one of two alternatives. They can either offer a course basically theoretical or clinical, depending upon the available laboratory or clinical facilities, or a combination of both, sufficiently balanced to include all of the agencies utilized in practice. The latter course is the ideal for undergraduate study, for it attempts to blend in the limited period an understanding of the principles of the therapy as well as the development of actual clinical experience. Such a course must not only accommodate itself to the existing curriculum in each particular institution, but must also be sufficiently elastic and adaptive to stress within the time limit the major agencies and the newer and accepted facts to the exclusion of some of the less important ones. Broadly, photo- and thermotherapy should receive more attention in the curriculum than hydrotherapy or massage. Indications, contra-indications and the therapeutic limitations of the various agencies should be pointed out; while the correlation of standard medical and surgical procedures with physical therapy should be emphasized. Such a program has been carried out at Rush Medical College. The plan of procedure and the outline of the prospective course when first presented to the dean of the school for approval and criticism read in part as follows:

The time allotted to physical therapy in the present curriculum is forty-eight hours. It is proposed in this period of time to present lectures, demonstrations and opportunities for the observation of the application of physical therapy measures in such proportions as will afford an elementary understanding of the motive underlying physical therapy practice and of the relation of physical therapy to medicine and surgery.

To achieve this objective three courses of procedure suggest themselves:

(a.) The planning of the study to include dominantly a biophysical background designed to inculcate the fundamental principles assumed to underlie physical therapy. This study plan will equip the student with the ability to recognize indications for physical therapy. It will, however, be practically destitute of any instruction in operative technics. This method appears to be the one suggested by the Council on Physical Therapy of the American Medical Association in its recommendation that biophysics be given in the last three years of the medical course.

*Read at the Mid-Year Meeting of the American College of Physical Therapy, Minneapolis, June 9, 1928.

(b.) It is not unlikely that in the present stage of scientific reorganization many of the theories which now pass for biophysical facts may undergo profound transformation. It is also certain that a complete survey of the existing courses in medical biophysics fails to offer a complete understanding of the application of physical therapy agents. Under these circumstances the alternative of intensive clinical instruction suggests itself. In this scheme, following the diagnosis, the student is taught the indications of physical therapy by practical demonstrations, including operative technics. Such a method merely acquaints the student with current practices in physical therapy, which coincides with the suggestion of the council for postgraduate instruction.

(c.) A compromise suggests itself in dividing the forty-eight hours allotted to the study of this subject between an initial period of twelve hours of biophysical introduction and a second period of thirty-six hours devoted to clinical considerations and the application of the essential biophysical elements. This alternative is an attempt to condense into forty-eight hours the essentials of physical therapy training, which, according to the council should begin with biophysics and conclude with intensive and prolonged courses of clinical application.

Not one of the three plans of study submitted is entirely satisfactory. The choice is the third alternative—the provision of an elementary biophysical background sufficient to inculcate the essential physical therapeutic principles and to provide a working knowledge of the clinical application of biophysical principles.

It is therefore, suggested that twelve hours be allotted to lectures and demonstrations on the essentials of biophysics; and thirty-six hours to the clinical program.

The lecture and demonstration course on the essentials of biophysics, must necessarily be restricted to the most obvious and outstanding principles which make for an intelligent comprehension of the philosophy of physical therapy. The time being short the pedagogical principle of repetition must be sacrificed. To compensate for the lack of this educational desideratum, the method of instruction should be that of combined lecture and demonstration. The topical outline would be as follows:

First Lecture and Demonstration.
The Biophysical Interpretation of the Human Organism.

a. A discussion of the material environment.
b. A discussion of the energy environment.
c. The biosphere as suggested in physical biology.
d. The apportionment of the energy environment:
    1. The current sense.
    2. The general chemical sense.
    3. The heat sense.
    4. The light sense.
    5. The ultraviolet sense.
    6. The mechanical sense.
e. Concepts of energy metabolism.
f. The significance of energy absorption.
g. The fundamental term of physical therapeutic application; the modification of a physiological system which has come to its normal function by the division of cell labor prompted by the division of energy apportionment.

Second Lecture and Demonstration.
The Current and the General Chemical Senses and Their Relation to Galvanism and to Sinusoidal Waves.

a. The work of Galvani and Volta.
b. Currents generated in the animal as measured by the electrocardiograph.
c. The effect of the galvanic current on the tissues of the body:
    1. Water electrolysis.
    2. Hydrogen ion changes.
    3. Ionic migration.
    4. Protein changes.
    5. Vasomotor changes.
    6. Muscle irritability: (1) the anodal and cathodal qualities; (2) effect of make and break; (3) effect of continuous flow; (4) the law of Dubois Reymond; (5) demonstrations on selected cases of the influence of the galvanic current.

d. Sinusoidal waves and the production of their graphs.
   1. The galvanic graph.
   2. The surging galvanic graph.
   3. The sinusoidal graph.
e. Modifications of the sinusoidal waves. Demonstration of muscle group contraction under the influence of sinusoidal currents.

Third Lecture and Demonstration.

a. Physiological exposition of the heat sensorium.
b. The physical nature of heat.
   1. Long wave heat (diathermy).
   2. Short wave heat (epithermy).
c. Components of heat production.
   1. Heat conduction.
   2. Heat convection.
   3. Heat radiation.
d. Natural and artificial sources of heat.
   1. Sunlight.
   2. Epithermy: (1) infra-red; (2) incandescent lamps; (3) Sonne's hypothesis; (4) hot packs; (5) electric baths; (6) baking cabinets.
   3. Diathermy: (1) the quantity factor; (2) the pressure factor; (3) the frequency factor; (4) the laws of Joule.
e. Hyperemia and a discussion of its general effect.
   1. The pain relieving effect.
   2. Bactericidal and bacteria inhibhibiting effects of hyperemia.
   3. Resorptive effect of hyperemia.
   4. Dissolving effect of hyperemia.
   5. Nutritive effect of hyperemia.
f. Physiological consideration of animal heat and detection of heat imbalance amenable to correction with physical therapeutic measures.
g. Radiant light.
   1. Fere's experiment.
   2. The work of Finsen.
   3. Infra-red.
   4. Visible light.
   5. Mixtures of infra-red and visible light.

Fourth Lecture and Demonstration.
Ultraviolet Radiation.

a. The history of ultraviolet discovery.
b. The nature of ultraviolet radiation.
c. Natural and artificial sources of ultraviolet radiation.
   1. Sunlight.
   2. Carbon arc lamps.
   3. Tungsten arc lamps.
   5. Mercury vapor arcs in quartz.
d. Spectrographic comparison and analysis of radiant sources.
   1. The heat, light and ultraviolet component of carbon arcs, tungsten arcs and mercury vapor lamps, air and water cooled.
e. Regions of ultraviolet activity.
   1. Near ultraviolet.
   2. Far ultraviolet.
   3. Air cooled ultraviolet.
   4. Water cooled ultraviolet.
f. Calcium and phosphorous metabolism as influenced by ultraviolet radiation.
g. The study and effect of ultraviolet radiation on rickets.
h. Bactericidal effect of ultraviolet radiation.
i. The chemical effects of ultraviolet radiation.
j. Theories of ultraviolet action.
   1. The Finsen theory.
   2. Other theories.
k. The effect of ultraviolet rays on cholesterol.

Fifth Lecture and Demonstration.
The mechanical Sense.

a. A discussion of massage.
   1. The principles underlying the effect of massage.
   2. Classification and description of massage movements.
   3. Corrective gymnastics.
b. Hydrotherapy.
   1. The mechanical effects of hydrotherapy: (1) the whirlpool baths; (2) various forms of spray.
   2. The temperature effects: (1) hot packs; (2) cold packs; (3) alternate hot and cold douches.

3. The vasomotor changes.
4. Various modifications of cell baths in combination with other physical therapeutic measures.

Sixth Lecture and Demonstration.

The Physiological Changes induced by Physical Therapy Measures.

a. The changes induced by galvanism.
   1. On the nervous system.
   2. On the white cell count.
   3. On the muscular system.
b. The changes induced by sinusoidal waves.
   1. On the voluntary muscle system.
   2. On the involuntary muscle sys-system.
c. The changes induced by heat.
d. The changes induced by light.
e. The changes induced by ultraviolet radiation.
f. The changes induced by massage.
g. The changes induced by hydrotherapy.
h. Summary of the changes pertinent to physical therapy treatment.

At the completion of the biophysical introduction thirty-six hours are devoted to the study of the technics of physical therapy. The greater part of this time can be devoted to actual demonstrations of the application of the biophysical principles in the treatment of conditions for which physical therapy is helpful either alone, or in combination with classic medical and surgical procedures. As a preliminary to the application of the measures on a living subject, the student will be led through a series of experiments on test material. The test material will be selected to insure the acquisition of technical skill. The system of electrode application is demonstrated. The principles of prepairng the patient are enunciated.

Attention is paid to the dangers incurred in the use of electrically operated instruments including: (a) ground free conditions; (b) avoidance of burns; (c) unreliability of tolerance by patients; (d) sequelae of over exposure and their prevention and treatment; (f) burns and treatment.

The practice of physical therapy follows a system which includes: (1) establishment of the diagnosis; (2) patho- physiological analysis; (3) selection of an energy which may effect a correction of the abnormal states; (4) need for combining several therapeutic agencies; (5) actual application of the proper physical measure or measures; (6) study of case histories. The courses will carry in addition definite reading assignments of contemporary literature. The following publications represent suitable reading material:

1. Lotka, A. J. Elements of Physical Biology; Williams and Wilkins, 1925.

2. Henderson, L. J. The Fitness of the Environment; MacMillan Co., 1924.

3. Mathews, A. P. Physiological Chemistry: fourth edition; Wm. Wood, 1925.

4. Kramer and Holst. The Atom and the Bohr Theory of its Structure; Alfred Knapp, 1926.

5. General Cytology. University of Chicago Press; 1924.

6. Luckiesh and Pacini. Light and Health; Williams and Wilkins, 1925.

It will be noted that the course is essentially a laboratory one in which the student is led by observation to the proper appreciation of the value of physical therapy. Suggested training is designed to impart such recognized principles as to familiarize the prospective physician with the nature of physical therapy measures, their relation to the contemporary understanding of the human mechanism in disease, their therapeutic possibilities and limitations, their contra-indications, and their status in modern scientific medicine and surgery.

ARTHRITIS*

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Arthritis is a difficult question to discuss because the diagnosis frequently is not an easy one to determine. I do not think that in any field is the diagnosis so confusing as in arthritis. However, in the past few years we have made some progress in the right direction by using x-ray and examining the blood chemistry of the patient. We are able now to pick out some arthritis cases from the whole ensemble and say, "Here we have a case of gouty arthritis, here is a case of rheumatic arthritis, here is a case of syphilitic arthritis or gonococcal arthritis." In arthritis the diagnosis of the type and the location of the pathology is of importance when treatment with diathermy is to be instituted. For example, if the patient complains of pain in the knee, the knee may be swollen a bit or changed in many respects so familiar to you. It would be of no value to simply apply diathermy to that knee if there is perhaps an existing bursitis or an exostosis. The action of the high frequency current would spread over the whole joint and the patient would experience a general heat sensation with a little or no relief. You can, however, obtain a more specific effect if you apply your diathermy anatomically or directly to the diseased part. In cases where the bursa is definitely involved the active electrode must be in contact with it.

In the treatment of the articulation types, the technic is very important. Imagine your patient lying on a couch and the limb stretched out. If you apply cuff electrodes above and below the knee, for example, the current must enter the limb between the electrodes. If the current has entered, it must choose a way or a path and its choice is through the shortest path and in line of lowest resistance. The lowest resistance is always the big blood vessels, consequently most of the current will pass through the muscles because they are filled with blood, and through the big vessels. Consequently very little will pass to the bone. If you desire to treat only the bone, this method of application is of least value, and you will be repaid by discouraging failure. If, however, you put the patient in a position so that the joint is bent at an angle and apply one small electrode directly over the articulated surface and the big electrode in a region opposite to the small one, then all the current must concentrate directly in the joint space. In this manner you will have concentration of action as well as heat penetration. Curative effect will be obtained only by following the technic just described and you will miss it if you apply the current to the whole joint. The current has the well understood tendency to choose the lines of the least resistance.

This principle also well applies to other diseases of the joint proper. For example, if a case presents itself with pains in the shoulder, many diagnoses are possible. Some patients have pains in the shoulder because they have an angina pectoris, other patients have pains in the shoulder because they suffer from referred pain due to chronic inflammation of the sphenoidal cavity. Other patients complain of pains in the shoulder, and if you examine them it will be found to be due to some infection in the region of the subdeltoid bursa.

Exact diagnosis is therefore of great importance in joint disease in order to localize the the treatment. With an exact diagnosis it will be found to be useless to treat the whole joint if you are dealing with a bursitis, or treating a joint when the affection is found to be located in the nasal cavity. Treating a shoulder will have the same affect as carrying coal to Newcastle.

I have already indicated elsewhere that acute infections are contra-indicated generally for diathermic treatment. I should not advise you in an acute polyarthritis to apply diathermy, because the bacteria are vitalized just as readily as the cells by high frequency heat. Not only are they vitalized, but they can be mobilized and can induce in your patient sepsis by spreading the infection over the whole body. In such

*Address delivered at fifth annual meeting, American College of Physical Therapy, Chicago, Nov., 1926.

diseases you are obliged to wait until the acute stage is passed. In the subacute stage you may use diathermy, especially in the chronic stages. There you will see that by producing a hyperemia and a hyperlymphemia you can to a certain extent absorb the connecting tissues which have been produced in consequence of the inflammation. You can make smooth scars and make the fibrotic material more elastic if they are formed inside of a joint; you can resolve exudations inside of the joint, liquefy and absorb them, and in that manner improve the patient very quickly. Thus we make use of the hyperplyphenic action, of the resolving action and of the liquefactive action and we benefit many chronic cases which cannot be benefitted otherwise.

Furthermore, bony deposits can also be improved by diathermy. You all know of cases where the patients cannot walk because of some bone excresence or spurs. You know how painful it is. We have no orthodox method to cure it. Two or three diathermy treatments relieve the pains. If you control the treatments by x-ray you will find for a long time that there is no change occurring in the bone. The pain however is gone. If you observe your patient still longer, you will then notice that, after a series of treatments there is none or very little of the exostotic material present. It will have disappeared or lost its point or become much smaller. In that manner you can prove that by diathermy we can produce absorption effects on bone, as controlled by x-ray observation. We may not expect a rapid absorption in patients who show great deposits in the x-rays, and we should not promise them that we can relieve them in a few treatments. We may, however, tell them, "We will repeat the treatment for two or three weeks." So perhaps for one year or two and by repeating with greater intervals we may slowly reduce exostosis and produce absorption of bony matter. The same is true of fractures if they are inside the joint as well as in the middle of the bone. It is very interesting to see that the same application of diathermy can reduce a very large callus and can reduce formation in bones which have not the tendency to reunite in a solid way. Both depend on the influence of hyperemia.

If you have a very large callus it is in many respects the same as an exostosis and by diathermy you produce a hyperemia and hyperlymphemia which affect its resolution. If you apply new blood very quickly to a fracture that has no tendency to heal, you stimulate the cells, and limit the fracture. The stimulus which in this case is diathermy, stimulates the cells to remove from the blood enough phosphorus and calcium salts to produce the callus which heretofore was inactive or absent. Thus you see that even for the reproduction of bone as well as for the absorption of bone, diathermy can be used with effect.

Now the question of gouty joint diseases. Gout is a constitutional disease and you will not expect that if you treat a gouty diseased joint, that you will cure the gout. We may say that in gouty disturbances we attempt only local effects; but these effects have sometimes more than local benefits. For instance in an acute case of gout where the infection is not in the joint but beside the joint, you can, sometimes, by single treatment, reduce the pain absolutely. In other cases you will reduce the pain only for a few hours, and have to repeat the treatment. You prevent by such application the definite deposits of uric acid material around the tissue of the joint or even inside the joint. You can in this regard help your patient very much, but you cannot cure the gout by diathermic treatment as we do not know from which point the gout has to be attacked. If we knew it, we perhaps would be able to treat by diathermy the cause of the gout, too. Now as to some traumatic cases of joint diseases. For instance, if you have a trauma to the knee joint, if you have blood extravasation, there is no method which will induce a quicker absorption of the hemorrhage inside the joint than diathermy. So we can relieve such injured joints by quickening the healing process in the torn or injured ligaments, and prevent disturbance of the function of the joint by diathermy. Experience has taught me that in spite of the hemorrhage, to apply diathermy early. If you wait three days after an acute hemorrhage, there is no danger in applying diathermy. You could expect that the hyperemia would produce a new hemorrhage, but according to my experience that is not the case. I

treat hemorrhage, for instance, lung hemorrhage, too, if they have stopped only three or four days. If you are careful in raising the temperature slowly and in making your blood vessels accustomed to the new pressure from behind, induced by diathermy, then you will not have an occurrence of hemorrhage. I recommend, even in traumatic cases, the application of diathermy very early, because you can avoid definite lesions which will take months and sometimes years to cure and reproduce the function of the joint.

DIATHERMY: ITS PRACTICAL APPLICATION AND TECHNIC*

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Diathermy means, or should mean, the application—medical or surgical—of a high frequency current oscillating at an average minimum of about 1,000,000 frequency per second and derived from the primary or coarse wire coil in contact with the outside of the condensers.

No matter whether the current or treatment be labeled on the machine or termed: diathermy, medical or surgical; d'Arsonval; auto-condensation (d'Arsonalization); each and every one of the arbitrary and somewhat ambiguous names refers to the invariably biterminal high frequency current of more amperage or heat and less voltage or push power in contradistinction to the biterminal—as well as uniterminal—high frequency current of less heat but infinitely greater voltage evolved from the secondary or fine wire coil, in either magnetic or direct connection with the diathermy or primary coil. In this paper I shall confine my remarkes to the medical and not the surgical application of diathermy.

Diathermy owes its therapeutic virtue preeminently, though possibly not entirely, to the fact that the current is not heat of itself, but a vibration which passes insensibly through the practically non-resistant skin to become converted, only through resistance in the deeper tissues ,into heat. The greater the resistance, all factors being equal, the greater the degree of heat evoked.

Unlike any other form of heat—that of light possibly excepted—diathermy activates or heats from *within* the tissues out and not, as in conductive and convective heat, from without in. Consequently, due to the physics of this high frequency vibration, the deeper underlying tissues traversed by the current are at least as hot, if not hotter, than the more superficial tissues and contacting skin; just the reverse of any other kind of utilizable heat, whereby the *skin* becomes invariably the hottest but underlying tissues are of progressively less thermal intensity. Therefore, diathermy is practically applicable and indicated whenever and wherever heat of a more or less deeply penetrant character is required; wherever congestion: circulatory stasis is in evidence, and a condition of hyperemia is physiologically and amelioratingly advisable, there diathermy will be of precisional value.

Stewart was the first to authoritatively demonstrate its value in pneumonia, but—its efficacy will be materially lessened in direct ratio to the dilatoriness of its application.

The industrial surgeon is enthusiastically aware of the value of diathermic heat, with its ensuing hyperemia, as an adjuvant for minimizing atrophy and dysfunction, otherwise the usual sequelae of prolonged convalescence. The pain and swelling due to overstrained muscles and ligaments, as especially evidenced in the not always correctly diagnosed condition termed "a sprain," is at once relieved by diathermy, which should invariably be the preparatory treatment for subsequent additional attention.

The gynecologist, unfortunately, does not yet appear to as fully appreciate the invaluable aid of diathermy in all those functional dis-

*Read at the second annual meeting of the Mississippi Valley Physical Therapy Ass'n., at St. Louis, Jan. 18, 1927.

turbances characterized by scanty, painful, or irregular menses; in ovaritis; and in the many indefinite pains and aches arising from stasis within the lower pelvis. Naturally one will differentiatingly diagnose these more easily amenable conditions from those originating in seriously gross pathology warranting surgical interferance. Diathermy is par excellence the indicated treatment for epididymitis; also for prostatitis, acute and chronic; bronchitis; pleurisy; asthma; wherever the same underlying condition of congestion is the etiological factor.

Applied a few days after abdominal surgery, in the average case, diathermy will more quickly and fully restore to normal the necessarily disturbed circulation of the affected parts and thereby greatly tend to lessen or prevent adhesions.

A popular but possibly aberrant newspaper writer upon medical topics caustically denies such a condition as "catching cold." Despite so avowedly and unscientific a phrase, the profession and laity alike quite readily recognize the condition or conditions characterized by some thoracic oppression or distress, with some cough, sore throat, coryza, excessive lachrymation, which in more or less pronounced combination quite frequently initiate some definite nosological entity. For this ubiquitously recurrent complex, diathermy, applied to chest and back, will often alone suffice; and invariably will be found an indespensible aid to any other indicated therapy.

Angina pectoris and many cardiac affections can be safely and quite satisfactorily treated by *mild* applications of this pain relieving normalizer of the blood stream.

Contrary to somewhat popular belief, diathermy may be quite safely and beneficially applied directly through the brain in certain cases of cephalalgia and frontal sinus distress. The French have long advocated such cerebral application as a stimulant to flagging mentality due to premature old age. It should not be thus applied, however, if any degenerative changes are in evidence which might ever remotely suggest possible danger of cerebral hemorrhage.

Medical diathermy is not practically indicated when only superficially seated pathology demands heat. It is imperatively contra-indicated in suppurative conditions, unless there be free drainage, and only then in exceptional cases; the possibility of hemorrhage also emphatically precludes its use. It is preferably not administered directly after a hearty meal, and is absolutely not indicated as a general treatment or a localized abdominal one until at least two hours after eating.

Practically everyone agrees that five minutes at least should be utilized in bringing the current to the maximum, and that twenty minutes of such maximum current is an average efficient duration. However, it is not necessary, as so stringently promulgated, to spend five minutes in reducing the current to zero; the heat will remain for quite a time within the tissues and though one would not suddenly terminate a treatment—unless in an emergency—nevertheless, a slow progressive diminution of the current, occupying a possible half minute or so at the most, is all that is necessary to secure the best results. Treatments may be given daily, if the condition so necessitates, though in most chronic cases, both the economic and the clinical factors are best served by three treatments per week.

When deeply penetrant heat is required, use diathermy and do not waste time wtih inefficient, superficial applications of vacuum and non-vacuum glass electrodes attached to the uniterminal Tesla.

I have now very briefly sketched the characteristics and practical applicability of diathermy, enough at least to serve as a basis for general discussion. But it is equally important and essential for practical attainment of desired clinical results to mention technic, which I will also demonstrate before you, as what the eye visualizes is far more easily appreciated and retained than by means of the ear.

Bare metal electrodes are far superior to moistened pads and water conduction, because in these latter the resistanse commences in the electrode itself and not—as it should, in the tissues. Electrodes are preferably applied anteriorly, posteriorly, or laterally and not as cuffs or obliquely, because with such placement the

physics of the current must necessarily limit the heat to superficial tissues or unduly restrict the area of deeper heat penetration. As it is imperative to apply the electrodes in close opposition to the tissues in order to thereby obviate the possibility of an air gap between, which would cause sparking, with attendant pain and lessening of current penetration, pliable tin or lead will be found the more easily applicable, convenient, and cheapest electrode material available. I find thin tinfoil, somewhat similar to that used for wrapping around chocolate, an unexcelled electrode medium in many cases where it would be difficult to accurately apply a more rigid material.

It is quite unnecessary to moisten the electrodes—except when applying over hairy regions and then it is preferable to thoroughly wet the hair itself—as the skin will provide its own conductive dampness if the technic of application be correct. Soap and other lubricants are actually antagonistic to the passage of electrical currents, which only pass through in spite of and not on account of these popular but unscientifically advised non-conductors . Conducting cords are entirely too heavy as a rule, thereby adding greatly to the probability of deranging or loosening the contact. Thinner wire will quite adequately and safely conduct the necessary amount of high frequency current requisite for all medical diathermy purposes.

As close apposition and uninterrupted application of the current is essential for perfect technic, the connection between electrode and cord tip is important. Most of the clip connectors are liable to pull out or at least are uncomfortably bulky to lie upon; a safety pin connector attached to a small piece of pliable metal or—more securely—fastened through a flap or tail of the electrode gives a smooth and efficient contact, an elastic bandage or a sand bag then retaining the electrode itself in place.

Never employ, as is too commonly thoughtless practice, a sand bag retention when treating any pulmonary condition; a respiration averaging 20 per minute and a sand bag of at least five pounds means 100 pounds additional weight for the weakened lung to labor under.

I find the thin autocondensation in conjunction with one metal electrode makes an ideally convenient and satisfactory method of treating a large majority of cases requiring diathermy. This modification not only gives the desired local concentration of heat but also a general, mild thermal effect, which latter, more often than not, is quite physiologically indicated.

For orificial application, as in the vagina and rectum, metal cylinders of convenient size and modified shape are used. It is important that these electrodes be not acutely pointed, as this is apt to dangerously concentrate the current. Also the metallic portion should preferably be restricted to such a length as not to impinge directly upon, and certainly not beyond, the muco-cutaneous edge, this latter being more sensitive to heat appreciation. As the mucous membrane will comfortably sustain a greater degree of heat than the skin, it is important to realize this comparative insensibility and thereby be careful to not exceed a safe limit of dosage. Despite an apparent popular appreciation of combination thermometer electrodes, I do not like them and see no appreciative need for these expensive instruments de luxe. In this opinion I am strongly upheld by most of the prominent authorities, both here and especially abroad. The temperature registered by the thermometer is in reality that of the electrode itself, and though this may serve somewhat as a comparative indication of the heat actually generated in the tissue, it would be dangerous in most cases to rely upon such a mechanical index, sensory thermal response is not alike in all, and a safe dosage in one individual might be quite the contrary in another, to say nothing of the various anatomical factors which materially affect a safe heat equation.

Silk floss cushions and rubber bath sponges of various size and thickness are invaluable aids in retaining electrodes in firm, yet elastic apposition where the irregular or hollow contours of certain anatomical geography would otherwise render such intimate contact difficult. One of these resilient pads or pillows applied even over a smooth contour quite often adds perceptibly to efficient apposition and retention.

SUMMARY

Diathermy is a high frequency current only recognizable as heat when meeting with resistance.

Diathermy is conversive heat, and thus concentrates within the deeper tissues, being unlike any other form of heat—convective or conductive—which only concentrates upon the skin.

As much and serious pathology is initiated by circulatory stasis, and the physiological antidote to same is hyperemia, diathermy—on account of its heat creating properties—is thereby invaluably indicated.

Diathermy is advantageously employed in most conditions as an invaluable adjuvant, and is not to be relied upon, except in some indicated instances, as an exclusive treatment.

Diathermy is as indispensable an aid to the general practitioner and surgeon as the effect of heat is in relieving congestion; and he who does not at least recognize when diathermy is indicated and thereby give his patients the benefit of same personally or by referring them to a physical therapy colleague is lacking in appreciation of the best interests not only of his patient but of himself.

Perfect diathermy technic requires not only a thorough medical training but additionally demands a knowledge of the physics of high frequency currents and an adaptive intuition towards its problems of technic; all diathermy treatments should therefore be first prescribed and subsequently supervised by the physician and *not* left to the unrestricted judgment of the technician.

110 Atkinson Avenue.

THE PRESENT AND FUTURE STATUS OF PHYSICAL THERAPY IN TREATMENT, TEACHING AND RESEARCH*

of the Physicians' Working Association for Physical Therapy.

PROFESSOR DR. GROBER, JENA
Director of the Physical Therapy Institute of the University.

In order that the importance of physical therapeutic methods be adequately recognized in the treatment of patients, in academic teaching and in scientific research and that they may be placed on an equal status with other methods of treatment in medicine, a year ago about 370 German physicians united in a "Physician's Working Association for Physical Therapy" and this memorandum is the first plea for their cause and in behalf of the public.

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II. (1.) Physical therapy is described as including mechanotherapy; gymnastics; therapeutic exercises and massage; electrotherapy with its various modalities, thermotherapy, the employment of heat and cold. One of the main parts in the latter is hydrotherapy but it does not represent the entirety of physical therapy as lay people often think. Mud and fango pro-

*Received for publication Sept. 7, 1928.

cedures, sand baths and other applications of heat and cold also belong here. Electric light baths are principally thermal applications but can also be counted among treatment by radiation. The field of the visible radiations includes the methods of replacing the energy of the sun's rays artificially. Radiation of chemically active nature includes especially the ultraviolet rays and beyond this follow the short wave radiations in the area where there are a great many uncharted wavelengths. Beyond these measures, which practically include the electromagnetic spectrum from longest to the shortest waves, are also to be mentioned in addition to the mechanical measures, the pneumatic treatment by increased or lowered pressure), climatic therapy and the problems of the action of the sun, the soil, of the wind and of moisture. Hydrotherapy is intimately related to balneotherapy, in which the physical problems of the spas play a more important role than the relatively small chemical contents.

2. The public nowadays wants physical therapy and its methods, for it feels instinctively that it includes therapeutic values, the scientific development and employment of which they can rightfully demand.

3. Physical therapy represents a part of applied natural science from which we can expect with certainty great scientific results. The electromagnetic spectrum is known today to include many forms of energy which we cannot as yet, or not fully, ascertain and investigate on account of lack of suitable receiving apparatus. We have to investigate them by the methods of the present and future physics, and study their properties as well as their action on the organism in order that we may employ suitable forms of energy for the treatment of the sick. Investigations on plants and animals, and observations on healthy and sick persons go hand in hand in order to furnish clinical experience.

4. For the healthy conditions of the body an early recognition of irregularities is of great importance. Any treatment by methods of physical therapy gives a physician who is scientifically trained and has practical experience, an opportunity to make a functional diagnosis, to observe the functional activities of the body and of its organs and thus determine their health or disease and their limits.

5. The host of rheumatic conditions and their after-effects; the after-results of industrial injuries and the diseases of the second half of human life uniformly decrease the working ability of individuals and are the principal objects of treatment and capable of considerable improvement by physical therapy.

7. One of the reasons for the great increase in quackery in Germany is undoubtedly the fact that medical science, enthused over the advances of chemistry and pharmacology, neglected physical therapy for a long time. Consequently lay people took hold of the methods and employed them with excellent results for their own purposes. The situation in Germany now is such that on one hand laymen are prohibited to administer medicinal poisons to patients; on the other hand, however, they are allowed, without any control, to administer physical methods in any dosage, even in lethal ones. This is an impossible state of affairs. The fact that physicians through lack of training or for other reasons leave physical treatments in the hands of servants helps to drive patients to quacks, because they lose confidence in their physician, who at best only prescribes physical methods but does not apply them himself or even supervise them. Patients thus feel that the physician has no knowledge or experience in this field.

III. The live interest of practicing physicians in postgraduate courses of physical therapy and their enrollment in the Physician's Working Association proves that the training of physicians in these matters is inadequate. Most universities do not give any sort of a theoretical course in physical therapy and do even less in the practical training in the subject. Physicians should get actual training and practice in the observation of the action of physical methods on the sick. Physical measures are mentioned occasionally in university lectures on some diseases but are never taught practically.

Physical therapy should be considered a sister-science to pharmacology. In university teaching nowadays it is not even considered a step-sister. The reason for this is that most

German universities do not possess teachers, and very few universities have the installations which are so indispensable for physical therapy. Development of physical therapy to an independent science took place when most of the present teachers of the universities had their clinical study behind them and hence their indifference. Overcrowding of the medical curriculum is one of the reasons given for omitting the teaching of physical therapy to students. The interests of the public and the state, however, demands really well-trained physicians and consequently there should be a prolongation of the time of medical study if necessary, to achieve this ideal.

The reluctance to establish properly equipped institutes for physical therapy in connection with all hospitals and teaching institutions is the more deplorable because the great advances in this field have proven that in many instances better results can be achieved by the employment of these methods than by other methods.

IV. The conclusions and demands formulated on the basis of the preceding are as follows:

Universities should teach physical therapy to students and arrange graduate courses for practicing physicians. Physicians should have in any medical institution the opportunity to employ modern physical methods. Most important is the promotion of scientific research in this field. In connection with clinical studies, at the bedside, the whole field should be systematically studied, especially in such parts where scientific investigation has not been made at all. It is evident that this study must be done also in closer relation to physics, biology and pathology and undoubtedly ought to bring very perceptible results.

Teaching and research work should be turned over to mature, experienced and scientifically trained men. The scope of modern, and especially future physical therapy will fill a life work of especially gifted scieintists. The independence of the department of physical therapy is most important. It should not be subordinated to medicine or surgery or any other speciaity. The University Institute of Physical Therapy is a central institution which has to serve equally all departments and must also have relations with the theoretical institutes of the medical faculty.

Physical therapy should be included in the medical curriculum by a two-hour demonstration lecture weekly for one semester, to be followed in a later semester by a practical course in physical therapy, to be given either four hours on one day, or twice weekly for two hours each day. There should be opportunity for special lectures on special divisions of physical therapy such as medical gymnastics, radiation, massage, roentgen treatment and balneo- and glimatotherapy. Applicants for the license to practice must show sufficient knowledge in the ordinary methods of physical therapy and should be examined by a special, well-trained examiner.

Certificates for the practical year of training should include the testimony of at least six weeks' practical training in the physical therapeutic institute.

THE HOW AND WHY OF SUCTION TONSILLECTOMY*

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Solely because a rapidly increasing number of progressive physicians have found they could secure results with physical therapy in its various forms, unattainable with drug therapy alone perhaps; it has advanced and attained to its present status of respectability and official recognition as a distinct and valuable branch of medicine.

We acknowledge our indebtedness to, and our admiration for those hardy pioneers, who have run the gauntlet; who have had the faith, the courage and the foresight to realize the possibilities in physical therapy and who have surged forward in ever increasing tide of successful accomplishment in this field.

Along with a general physical therapeutic advance in medicine and surgery as a whole, there has been an equally energetic effort to advances in the various special fields.

The most frequently performed surgical operation today is undoubtedly that of tonsillectomy. Truly the tonsil fossa is a "No Man's Land;" or more accurately an "Everyman's Land." The laryngologist has strenuously insisted that the tonsil was and is his special property, and his alone. Strictly speaking, he undoubtedly has as good, if not a better claim; but the way matters stand, the general surgeon and the general practitioner undoubtedly do as much, if not more tonsil work than the nose and throat specialist. It should not be this way, of course, as a properly performed tonsillectomy is often a very difficult operation; and always an operation with possibilities of danger to life. We are speaking here of the strictly surgical tonsillectomy. Under these conditions and circumstances, it stands to reason that the trained laryngologist is better equipped and better able to handle this work. Be that as it may, however, the fact remains that the general surgeon goes right along doing every tonsil case that comes to hand. Many general practitioners do their own tonsil work; and much of it, very satisfactory work.

*Read at sixth annual meeting, American College of Physical Therapy, Chicago, Nov. 3, 1927.

Almost any tonsillectomy technic is generally satisfactory in the hands of an operator trained, equipped and sufficiently experienced in that particular technic; but it is a fact that the older technics are often difficult for the average operator on certain types of tonsils, and that the operative and cosmetic results of many of these older operations, leave much to be desired from both the operator's andt he patient's standpoints. How many cases have we all seen, often after operation by good operators, where a good-sized piece of tonsil has been left in one or both fossae; where the pillars have been more or less damaged; or where an uvulva no longer exists where it formerly held forth? The less experienced the operator and the more difficult the particular case; the greater percentage, of course; or at least the greater possibility of unsatisfactory result. How many alarming, if not dangerous to life, hemorrhages occur in the work of the skilled operator; and how many occur at the hands of the occasional, poorly equipped perhaps, and poorly trained and experienced operator?

The point we make is that tonsillectomy should be considered a major surgical operation; to be performed only by the well-equipped, well-trained operator. It make little difference if he calls himself a specialist, a surgeon or a general practitioner, provided he has the equipment and the ability to perform this operation properly and with safety. It is beyond the scope of this paper to point out when and when not to perform a tonsil enucleation; but there is no question that hundreds of "innocent" tonsils are lifted every year, and that still more hundreds of "guilty" tonsils escape.

One has but to consider the hundreds of tonsil instruments in our surgical catalogs; to note the many "modifications" of this and that instrument or technic; and to witness a "mine run" of tonsils by an average operator to realize many of the disadvantages and dissatisfactions of the older tonsil operations.

Suction tonsillectomy was slowly and somewhat laboriously evolved out of this situation, not as a protest, not as a cure-all for our tonsil operation troubles; but in a sincere effort to develop a tonsil operation devoid of the difficulties and disadvantages of the older operations, one reasonably safe; and simple enough in technic for any physician, at all competent, to operate.

We may say this: The operation is equally applicable to local and to general anesthesia operation; it is an in-capsule enucleation, and it is rapid, practically bloodless.

We hold no quarrel with the Sluder operator; or with the snare and dissection technic. If the individual physician feels than he can handle the pathologic tonsil better with ultra-violet light; with radium; with x-ray; with endothermy; he should continue to employ his most satisfactory weapon. These all have their place in the sun. An operator who has so perfected his Sluder technic that all tonsils look alike to him, and who is thus able to secure a perfect in-capsule enucleation on all his tonsil cases, should stick to this technic. Likewise with the snare and disection operator. If he is 100% sold on this operation, he should stay with itt. If electrocoagulation, or better perhaps electro-desiccation seems best to fill the bill, this mode of attack should be adhered to.

To the operator, however, who has become discouraged with his inability to "get" all types of tonsils with his Sluder; to the operator who is weary with working his way out of the bloody shambles of many snare and dissection forays; and to the operator taking up tonsil work without too firmly preconceived ideas as to this and that, we would respectfully recommend suction tonsillectomy as worthy of a try-out. Not as the only way to remove tonsils, and not by any means necessarily the best, but an operation which removes some of the difficulties and dissatisfactions of the older technics; an operation which makes the work a little easier for the patient and for the operator; and which somehow seems to make the vast majority of really difficult tonsil cases, work out rather easily.

Now a brief word as to equipment. We cannot in this brief space go into minute details of technic; but will try to touch here and there points of importance for perfect operation.

Suction tonsillectomy is peculiarly a physical therapy procedure, as well as surgical; making use as it does of the modern electrically driven compressed air suction pump. Adequate suction or lifting power is very essential if we would stretch adhesions and lift any and all of these deeply submerged and badly adherent tonsils from their fossae, so that our snare loop can properly dissect and in-capsule enucleate.

Suction pump; set of operative tonsil suction tubes; snare; tongue depressor and mouth gag for general anesthesia cases comprises our major equipment. It goes without saying, however, that any physician essaying tonsil work, should be fully equipped with the customary instruments for throat work.

Our air pump may be portable or semi-portable in cabinet. The portable type is an essential, if same is to be transported from office to hospital or clinic. Where mounted on casters it may be moved to any position in the operating room, or from room to room. In either event our air pump should be of sturdy construction, and capable of day in and day out heavy duty. It must render sufficient suction, and that is where the majority of air pumps on the market today are pitifully inadequate. Operative range of suction should run from 15 to 20 inches with say 25 inches maximum. Rarely do we need over 20 inches; but this reserve power is of value with dense adhesions and submerged tonsils. Suction should be readily regulated up or down by proper control device, and an accurate guage should be attached. The suction pump must be protected by a reservoir suction bottle in front of the pump, as otherwise blood and saliva will be drawn into pump and destroy its efficiency. Pump should be foot-switch controlled, in addition to the usual hand-switch. Foot-switch control of our pump leaves both hands free for operative use, and renders the operation truly a "one man job." We prefer a foot-switch of the type where slight foot pressure starts the motor and stops it by raising foot; this is more accurate than the foot-switch where a downward pressure locks the switch on, and a second down pressure is needed to release. For this work, when we need suction we need it instantly.

A good many types of air pump have been successfully used for operation; but we would especially recommend a hook-up developed by us in the past year, using a duplex Robertson type pump on a plain base.

This pump hook-up is described in detail in the October, 1927, issue, American Journal of Physical Therapy, and is giving us perfect satisfaction. With foot-switch control, it is arranged for ether vapor production if desired and carries a main operative line of suction; and a separate auxilliary suction line for suction cleansure of the throat in general anesthesia work. Both suction lines are fully protected by quart-capacity reservoir bottles; and so powerful is this air pump, that these reservoir bottles are exhausted and full suction developed almost instantly. The outfit is easily portable from office to hospital or to private residences, as desired; and yet is heavy enough to insure long life and efficiency.

A set of three sized operative tonsil suction tubes should be at hand for operation. The vast majority of operations are performed with the medium size tube, less with the small size tube, and rarely do we find it necessary to use the largest size.

We find a ratchet type snare of the Beck-Fierce or as it is also known, Beck-Schenck type, best adapted to the operation, and this snare should be of good workmanship, as suction tonsillectomy requires heavy duty from the snare, much more so than in dissection work. We use two snares, this expedites operation considerably, especially in general anesthesia work. As soon as the first tonsil is enucleated, the second fresh snare is picked up and the second tonsil removed without the delay of replacing snare wire. Only the very best grade of snare wire should be employed, and we find a No. 8 size imported German wire to be very satisfactory. Sizes larger than this are stiff and difficult to employ in present-day snares.

A mouth gag of the Denhardt type is very good for general anesthesia work; but a gag of the Jennings type is used quite often also. For general anesthetic work, we find drop method ether delivered to a modified Yankauer cone from an anesthesia arm, to be eminently satisfactory. Occasionally we run ether vapor in course of the operation. For local operation novocain continues to give excellent service. For operators who prefer an adrenalin combination, the Martin formula of novocain 1% or 2%, antipyrin 1%, (1/1000) adrenalin 1% proves very efficient and lasting. Novocain 1% and quinin-urea 1%, equal parts—is also a local anesthetic of value in this work.

Time does not permit detailed technic here; but we may emphasize that the secret of success rests in proper equipment and in proper use of that equipment. The most important single step in operation is to completely lift the tonsil from its fossa with proper use of suction tube, which should be the size just sufficient to include the given tonsil and no more. With adherent tonsils care must, of course, be taken to avoid buttonholing or otherwise injuring anterior pillar. Preliminary dissection is not necessary, and merely a waste of time. In small throats with large tonsils—a combination often met with in children, particular care must be taken to avoid dragging the uvula into snare loop; and we often find it advisable to grasp the tip of the uvula and hold it out of harm's way with a small slender grasping or tissue forceps. Each tonsil should be carefully inspected after removal to see that its capsule is intact, as a torn capsule usually means a piece of tonsil tissue of varying size has been left. More often a torn-off bit of tonsil tissue will be found adherent to the posterior surface of the anterior pillar, or high up under the posterior pillar. Where a tonsil has been sliced, as sometimes happens through use of too small a tube for the given tonsil, the base should be removed with a smaller tube and fresh snare.

With a little experience, however, practically every tonsil will be removed cleanly and easily in capsule without damage to other throat structures.

The operation has been practically bloodless in our experience. The local cases will sometimes expectorate a little blood and saliva into the pus basin after each tonsil is out; but this usually lasts for but a minute or two. With children we aspirate a little blood and saliva into the reservoir bottle, but the blood loss is negligible as a rule. While not an exact necessity, we

believe it good practice to give calcium a few days before operation and a pre-operative dose of fibrogen or hemostatic serum.

We do not know that suction tonsillectomy can be considered an entire preventitive of post-operative lung abscess; but so far as we have been able to find out, no cases of this grave complication have been reported after the operation. Certainly the pre-operative vacuum cleaning to which each tonsil is subjected at start of the operation, with evacuation from the tonsil crypts and the throat of often considerable amounts of tonsil exudate and debris, makes for lessened danger of aspiration into the air passages of this all potentially dangerous matter. In the Sluder and in the various snare and dissection manipulations, this material is usually squeezed out of the tonsil into the throat, ready at hand for aspiration under suitable conditions. This danger has been recognized in the several cup-like devices developed for attachment to Sluder-type instruments, to receive tonsil debris. A far simpler procedure would be to vacuum-clean all tonsils prior to operative removal, whether subsequent enucleation is by suction tonsillectomy, or by other method.

Answering the question, "why suction tonsillectomy?" in preference to the older technics, we may say in conclusion that it is unquestionably the easiest and the most rapid method of enucleation. The simplicity and ease of operation means that better tonsil work will be done by more operators. The more difficult an operation, the fewer who will really master it; and the fewer cases of perfect operation in consequence.

Extreme rapidity is hardly desirable in any operation, but in ordinary sequence, suction tonsillectomy is as rapid as any operation ought to be, and may be made more rapid if the circumstances dictate. We do not believe the operation should be done under gas or under chloroform; however, as conditions occasionally develop even in "easy" cases, where speed cannot be made consistently with good, thorough work. Ether permits enough time for careful operation; and yet with it a minimum of anesthetic and rapid recovery from the anesthesia.

Complete in-capsule enucleation is the only type of surgical enucleation of the tonsil to be considered in this day and age, and the suction ttonsillectomy operator should reach 100% in this direction.

The operation "gets" all types of tonsils cleanly and smoothly, and the operator quickly gets to the stage with his technic, where truly all tonsils look alike to him. Some cases, of course, are in actuality more difficult than others; but even the difficult ones become so comparatively easy that one has to be somewhat on guard to avoid over-confidence.

While no tonsil operation of a surgical type can strictly be classed as bloodless, it will be found that with proper technic, suction tonsillectomy is bloodless to the extent that rarely if ever will there be any appreciable blood loss or the necessity arise for any measure to check bleeding.

One of the strongest features of the operation is the greatly lessened post-operative reaction. The local cases have no operative pain, suffer no fright or surgical shock to speak of, because of the rapidity and ease of enucleation and are not weakened by blood loss. There seems much less after-pain and discomfort; so much so that rarely is it necessary to give medicine post-operatively for relief of pain.

Convalescence after suction tonsillectomy is shortened about one-half that of enucleation by the older technics. Adult cases complain very little of their throats, except for muscle stiffness and discomfort on swallowing the first twenty-four hours or so; and by the second or third morning are almost ready for their usual breakfast. Children give but little thought to their throats as a rule after operation, and except for the upset from ether, have little bother. Owing to rapidity of operation, they receive a minimum of anesthetic and recover in consequence in record time.

A doctor, who had his tonsils "dissected" out several years ago brough his two little girls for tonsil enucleation, and after witnessing their operations and several others, local and general, commented that if he had his tonsils still in and required their removal, he would travel a thousand miles if necessary, to have them removed by suction tonsillectomy in preference to any more "dissection." This comment may seem

overly enthusiastic; and of coure, one swallow does not make a summer; but when so many operators of large experience have been equally enthusiastic after extended experience with the operation; and so many patients have all "gotten along nicely" and been such enthusiastic boosters to their friends and relatives; even the most skeptical must admit that perhaps there is something in it.

THE REMOVAL OF HEMORRHOIDS BY MEANS OF THE HIGH FREQUENCY CURRENT*

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Professor Doumer of Lille was the first to use electocoagulation in the treatment of hemorrhoids, almost a quarter of a century ago. Since then, the method has been employed by a rapidly increasing number of physicians, because of the many advantages which it offers over the usual surgical technic.

The operation does not require hospital facilities for its performance. It may be readily done in the physician's office, and the patient permitted to go home afterward. This is a great advantage, especially for those individuals who dread hospitalization.

Under proper local anesthesia, the operation is painless. The after effects vary, but, in general, are less distressing than those experienced after surgical hemorrhoidectomy. Frequently, patients so operated will go about their business directly afterwards. This is not an advisable procedure, but occasionally, where necessity has compelled such conduct on the part of the patient, there have been no distressing after effects.. As a rule, it is best that the patient stay in bed for a day or more if that position is most comfortable.

There is no bleeding during the operation. This is of particular advantage where, as frequently occurs, the patient has developed a secondary anemia, due to the constant loss of blood from his hemorrhoids.

Infection does not occur at the time of operation inasmuch as the operation itself is a sterilizing procedure: the heat generated is sufficient to destroy micro-organisms as well as body cells. The occurrence of embolism is precluded by the fact that there are no clots or loose tissue left in the blood vessels to be taken up by the blood stream and swept to some other part of the body. The lymphatics and blood vessels are sealed by the treatment.

The methods available for electrothermic destruction of hemorrhoidal tissue are desiccation and coagulation. The character of the redundant tissue determines which one or combination of these methods may be employed. If there be but a small varicose area, the Oudin type of current is used, until a complete desiccation of the area occurs. I frequently intensify the action of the current by grounding—or as the English call it—"earthing" the patient. This is readily done by placing the patient upon a large metal electrode which is connected to a steam radiator, water pipe, etc. In the presence of large hemorrhoid masses, I prefer to use electrocoagulation.

I employ the pointed active electrode where the tissues cannot be grasped by means of the electro-surgical clamp which I have devised. The circuit is completed by placing the dispersing piece of metal underneath the buttocks of the patient as he lies upon the table. With this method a diagram of the electromotive lines of force would represent a cone with its apex corresponding to the pointed electrode and its base to the dispersing metal plate.

The depth to which the tissue is destroyed is dependent upon several variable factors which cannot be accurately gauged. These factors include the amount of current used, the length of time it is permitted to act and the electrical resistance of the tissues.

The electro-surgical clamp method is the preferable one in every instance where it is possible to apply it, because the destroyed area is more definitely delimited.

The coagulation occurs only in the area lying between the jaws of the clamp. This obviates the danger of destroying too much or too little tissue. The uncertainty as to the depth of the destructive effect of the current is removed. The area is destroyed exactly as desired, permitting the immediate removal of the hemorrhoid.

The action of the electro-surgical hemorrhoid clamp is in no way comparable to that of the ordinary surgical clamp used in the clamp and cautery method. The ordinary surgical clamp compresses the tissue at the base of the hemorrhoid, insuring hemostasis when the tissue beyond it is removed. The electric clamp has only very slight compressing action, being so constructed that its jaws are separated where they are applied against the hemorrhoid. The very purpose of this separation is to prevent the hemorrhoidal tissues being compressed tightly, thus insuring a broad base which can be coagulated by the action of the electrical current. In the usual clamp and cautery operation, an artificial tuck of skin, of mucous membrane, or of both, is made, and the tissue removed along a very thin linear area. This area is then seared over with actual cautery. What happens therefore is a superficial carbonization of tissues over a thin line. With this technic, the occurrence of secondary hemorrhages may be explained by the tendency of the adjacent remaining tissue, which has thus been artificially tucked, to pull apart, the glueing action of the thin and superficial carbonized area being insufficient to hold it together.

With the use of the electro-surgical hemorrhoid clamp, the destructive action actually occurs within the tissues embraced by the clamp. The resistance of the tissue to the passage of the electric current of high frequency, which is traversing it between the two active electrodes on either side, causes the development of heat sufficient to coagulate it. The destroyed area thus has sufficient width and depth to hold the healthy ends of tissue firmly together and thoroughly to cover the healthy tissue underneath.

After the base of the hemorrhoid has been coagulated, the area above it may be removed by means of scissors, scalpel, or the electric cutting current. This is better than permitting the tissue to remain *in situ* until it sloughs off ten days to two weeks afterwards; the dead mass acting like a foreign body, causing mechanical irritation and producing an offensive odor as it decays.

The preparation on the part of the patient consists in the thorough evacuation of the bowels, aided, if necessary, by an enema. If the operation is to be performed in the morning, it is suggested that the patient partake only of some crackers and milk. If in the afternoon, the patient is asked to take only tea and toast for lunch.

The operation may be performed with the patient in the lithotomy position . It is not necessary to use an insulated table. After the region about the anus is washed with soap and water and painted with some antiseptic, the local anesthetic is injected perianally. The perianal method of anesthesia is preferable for two reasons: it allows dilatation of the sphincter, permitting ready access to internal homorrhoids; and it does not distort the shape and size of the

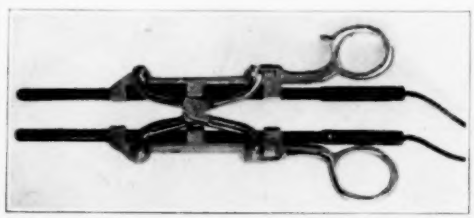

Fig. 1. Bierman's Hemorrhoid Clamp for Electrocoagulation.

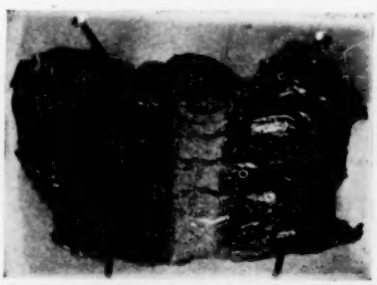

Fig. 2. A cross-section piece of meat showing a line of coagulation after application of clamp.

hemorrhoidal mass as does the local injection into the hemorrhoid itself.

The after treatment of patients operated on for hemorrhoids by means of the high frequency current consists preferably of rest in bed for a few days, depending on the amount of discomfort, and the application of some soothing ointment such as butesin picrate. If there is much discomfort, it is advisable to use hot compresses of magnesium sulphate solution and if necessary suppositories containing opiates.

DISCUSSION

Dr. F. W. English (Saginaw, Mich.): Thrombotic hemorrhoids cannot be treated by the injection method. By local anesthesia you can lay the hemorrhoid open, incise and remove the clot and usually it will be well in a day or two. The edges fall together with little, if any, bleeding. As to local anesthesia, novocain is all right, whatever per cent you feel like using.

As to the number of milliamperes in diathermy, you can't miss it if you turn on enough current until the hemorrhoid turns a gray color. It may be one to 100 milliamperes of current. I have not used diathermy of late because I have found success with other methods.

Dr. J. U. Giesey (Salt Lake City, Utah): The clamp method which Dr. Bierman has presented seems to be a great advance, inasmuch as it offers a reasonable insurance against hemorrhage, a certainty of the removal of the hemorrhoids, and the better control of the operative field.

I am very glad to see this marked advance in the diathermic method of treating hemorrhoids. Galvanization of hemorrhoidal tissue is less traumatic, but it is the more prolonged method. It does not compare in effectiveness to that of diathermy, nor in promptness of restoration of the operative field to the normal state. It is, however, a safe office method of treatment and is not to be shelved in spite of the newer advances. Pain is to be expected whenever tissues are traumatized, and traumatizism follows any of the methods discussed. The pain, however, is relatively less intensive following surgical diathermy than by orthodox surgery.

Dr. W. J. Wick (Chicago, Ill.): The objection I have to Dr. Bierman's operation is that when you pick up your clamp you must remember your underlying anatomical structures, such as the mucous, submucous, muscular tissue, and the imbedded blood vessels. When you pick up your clamp, put it on, and use your diathermy, you do not get your blood vessel. You get your mucous tissue as a rule, the same as when I pick up the skin of my hand my blood vessels escape, just as in most of the cases I have noticed that you pick the pile up with forceps and get it out. Of course you can go after it and get it out, but your clamp is too thick. You can't get at it in that way; you will not get your blood vessel, and the consequence is your patients will return, because the operation was incomplete.

I must compliment Dr. Bierman on his operative skill, because it appears to be very complicated. I should warn anybody that unless he is a very skillful operator he should be careful about an operation of that kind. I have seen many cases of incontinence or partial incontinence due to the clamp and cautery operation; too much tissue was destroyed; the sphincter was cut, or too much scar tissue followed, and the consequence was incontinence or partial incontinence or flatulence and the patient was crippled for life.

Dr. Frank H. Walke (Shreveport, La.): In the treatment of hemorrhoidal cases, all of you know that patients would have themselves operated upon more frequently provided they could remain ambulatory. By the method of electrocoagulation, galvanism, or injection, we know that a patient can stay on his feet and do his usual work without much discomfort. The first and also the essential step is the proper anesthetization of the part. The perianal route or the local infiltration of the part is a matter of choice of the operator. The special technic I use is to first anesthetize the posterior commissure; the patient lies in the left lateral or Sim's position; the assistant holds the buttocks apart. You sweep around the mucosa of the anus, using a 1 per cent novocain, and back it up with a 2 per cent quinine and urea solution. I use a long, two-inch needle, and go straight in along the line of the anesthetized area. Care of course, must be used not to puncture the rectum. I do not think there is any great harm done if you do. I have done it on several occasions without

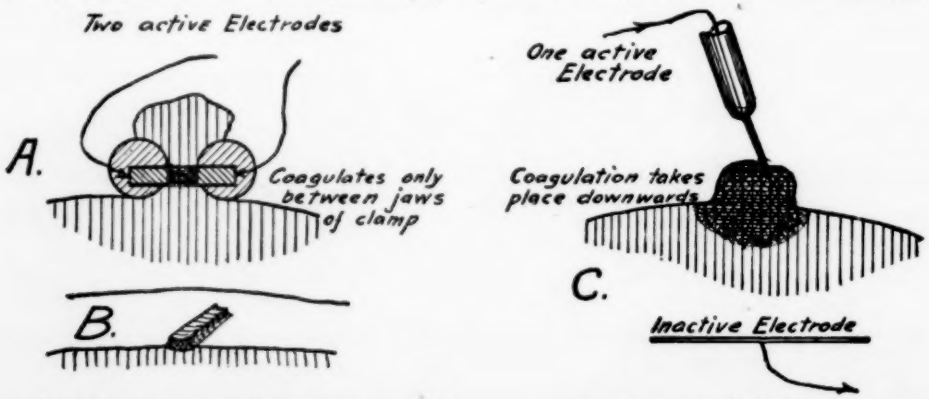

Fig. 3. *A* indicates that coagulation takes place only between the jaws of the clamp; *B* is the schematic presentation of the stump after the superimposed tissue has been removed; *C* shows (in exaggerated fashion) the comprehensive coagulating action of the single active electrode.

any bad results. You can, however, put your finger in the rectum, if you so desire, as a guide for the needle.

The technic in coagulating hemorrhoids is that you must only coagulate in the region of the mucous membrane; you must not go as far as the skin. If you place your needle in the skin you will produce painful swelling and edema. The mucous membrane and the varicose veins are easily destroyed although it may not appear so during the time of operation. But wait four or five days and you will see it gradually contract and go back to a normal state without any discomfort. If you get into the skin do not coagulate, but take it off surgically, or inject it with phenol and it will disappear. But where you are dealing with a skin pile and you coagulate, you produce extreme pain.

I order my patient to return on the third day, and administer to him several high frequency treatments with glass electrode. It is very sedative and pain relieving.

I frequently resort to fractional operation, in which I remove a portion of the pile, and order the patient to return on another day until the entire mass is removed. This is particularly of value for patients who are not able to take time off and be hospitalized. In conclusion I wish to voice an opinion that the procedure has superior virtues than that of cautery or cautery and incision, and merits trial and more universal adoption.

Dr. Schneider (Williamsport, Pa.-: I want to emphasize the importance of a thorough rectal examination. It is my practice to make a thorough examination of every patient that presents himself. If there is anything vague, the pathology is perhaps below the diaphragm. If you make a thorough examination of the anal and rectal region in nervous or neurotic patients, you will probably find some pathology there.

In the past year and a half I have done about 200 or more operations with Dr. Bierman's clamp. I prefer that to any of the other methods that I have used. Most of the foregoing cases were done in my office with a one-half to 1 per cent novocain. Recently, and because we have a very large and newly equipped physical therapy department in the hospital in my town, a good many of those cases have been hospitalized. I feel that the Bierman clamp has done a lot to make the operation for hemorrhoids a simple procedure. I have had one or two cases with hemorrhage, but I believe it was my own fault. I did not get the vessel.

Fig. 4. Showing the hemorrhoid held up by means of an allis clamp with diathermy clamp in place for coagulation.

In my experience the after-pain is more severe than is credited to this method of operation.

Question: Inasmuch as we coagulate skin surfaces and have no pain resulting, I was wondering if we could operate upon so-called external piles by this method. I know that an external pile very often will dwindle away because it is connected with the one that comes from the internal part and it escapes over the sphincter and it will shrink up. The other question I want to ask is if he has to supplement the dilatation that he gets from his local anesthetic by manual dilatation. In using the old clamp and cautery method we were very careful always to get a complete temporary paralysis of the sphincter muscle. I would like to know if local anesthetic is sufficient.

Dr. Wi ilam Bierman (New York City): There are a large number of points which I did not cover because of lack of time. I did not, for example, speak of one particular virtue, namely, the use of electrocoagulation, and electrodesiccation, in that it is a flexible method. If there is any little area of prolapse, if there is a polyp present, if there is a fissure present, you can treat all these conditions at the same time you treat the hemorrhoid. That is one advantage in the use of electrocagulation and electrodesiccation. In fissures, we dehydrate the surface of the fissure. We find that to be sufficient.

Dr. English spoke about straight surgery being successful in only 50 per cent of the cases. The one great point of merit that I can see in the use of electrocoagulation and electrodesiccation is the fact that you are least apt to get recurrences. There isn't any such thing as a recurrence. No hemorrhoid ever recurs if it is destroyed; the additional small, varicose areas cannot be touched by surgery. It is that little varix that in six months or more blooms out into a full blown hemorrhoid. It is these small varicose areas which can be

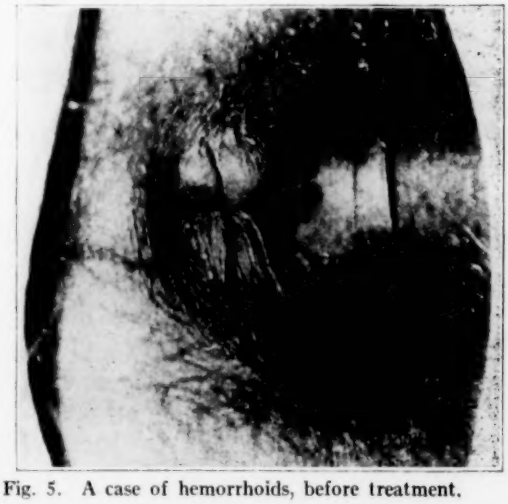

Fig. 5. A case of hemorrhoids, before treatment.

so readily destroyed by electrocoagulation and electrodesiccation. In that, if in nothing else, we have the greatest amount of pile insurance any operative method can give to the patient who comes to the physician for relief. I throw that as a challenge against all the other methods.

There is virtue in the use of galvanism, there is virtue in the use of the injection method. Dr. English need not have been so hesitant. There are many good proctologists throughout the country who are using carbolic acid injections but they usually modify their statement when they advise that method of procedure by saying that it should be used only in uncomplicated internal hemorrhoids.

Those of us who have done enough work in hemorrhoids realize that not all hemorrhoids are nice, smooth little bits of things covered by mucous membrane. If they were, possibly that method of carbolic injections or some other injecting solution would be the method of choice. In uncomplicated internal hemorrhoids I think there is great advantage by the injection route and in instances there is advantage in using the galvanic current. Incidentally, unless I took your remarks wrong, Dr. English, and I tried to be very observant, you seemed to confuse the use of galvanism and diathermy. You spoke of the use of 10 and 15 milliamperes of current and in those instances there was not the occurrence of some malodorous sloughing mass. Unless I am greatly in error you were confusing it with galvanism. I know of no amount of high frequency current which you can narrow down to 10 or 15 milliamperes and get much of a destructive action. I may be in error.

Dr. English spoke of the use of dilatation and silver nitrate in the fissure. That is a well known method. Most of the fissures I have observed have been in connection with hemorrhoids, and there I have had anesthetization, I have usually used the monoterminal or Oudin type of current and found that to be satisfactory in dehydrating the tissue.

Dr. Giesey spoke about prolapse. I might possibly put in a word of caution. I do not claim that electrocoagulation and electrodesiccation is the method of treating all cases of prolapse. I think this method should be applied where there is a large amount of redundant mucosa, but where the entire rectum comes out as a sleeve as we have seen it occasionally, we have to be extremely careful in coagulating the tissue for fear of coagulating through.

Fig. 6. Same patient as in Fig. 5, after removal of hemorrhoids by electrocoagulation.

If you remember your peritoneal reflections, and if you recollect that in the pathologic state of prolapse it is possible for the pouch of Douglas to come down along with the other parts of the rectal wall, you will realize that there is danger in cases of true prolapse. I have tried to be conservative in the field in which we are all more or less considered radical.

Dr. Wick spoke about the particular clamp which I have devised and said that he hoped we had by this time gotten away from clamp methods. From that remark and from his description of my clamp I can see that he has but a very faint conception of what that clamp is like. Possibly the word clamp is a great misnomer. It is quite evident to me that you have a very poor canception of what my clamp is like. It has no relation whatsoever to the ordinary clamp. You also said that in using this clamp we avoid the vein. That it slips away and we are able to get hold of the muscular coat or the muscle with a possible result of paralysis. It takes a clever vein to slip away from us, and be unharmed as we destroy the muscular tissue underneath.

Dr. Wick (Chicago): My point is that you do not take the vein.

Dr. William Bierman: All we can say is, whether we got the vein or not, in the several years that we have been doing this work, the vein providentially disappears. It is a remarkable coincidence for which I thank diathermy.

With reference to Dr. Walke's statement bearing upon the coagulation of skin, I have observed, as he has, that the amount of reaction is much greater where you destroy skin than where you destroy mucosa. Where I can, I try to destroy m external hemorrhoids, usually at the cutaneous junction. from the mucosal side.

The last speaker in this review, before mself, brought up the point why we get reaction when we coagulate skin. I do not know; but it does occur in destroying the skin around the anal mucosal junction.

As to the dilatation, I use the perianal anesthesia. Dr. Walke described it with thoroughness. I didn't want to go into it because there is nothing particularly original in it. There is nothing in it bearing strctly upon physical therapy, and it would have taken additional time. What I do after I have injected the anesthesia perianally, and I use between 25 and 40 c.c.s of 1 per cent novocain, is to dilate with my index fingers very, very gently. I do not try to divulse the sphincter. I find very little pressure is sufficient to expose the lower end of the anal canal to view so that I can discover and get at any internal hemorrhoid which might be lying fairly high up.

X-RAY PROTECTION*

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It may seen superfluous to present a subject so often discussed as has been the proposition of "X-Ray Protection." Since there are hundreds of reports in the literature pertaining to the ill effects of x-rays, over exposure, effects of stray, and secondary radiation on the operator, the writer hesitattes to present this article. One is almost tempted to apologize for that which appears to be a needless repetition.

Regardless of the many ill-fated cases referred to in the literature, there are hundreds of x-ray laboratories operating throughout America much in need of additional warning. During the past three months the writer has visited and inspected more than 75 laboratories. In many of these institutions he has done demonstration examinations, and has been in a position to observe and study the working conditions under which the laboratory personnel must labor. It may sound astonishing, but there are nearly 60 of the 75 laboratories visited having nothing in the way of protection for the operator, that is, lead screens, booths, etc., and more than 50 of the institutions do not even possess an aluminum filter! In every instance the patient is subjected to lengthy x-ray exposure, with a moderately close target distance, without the protection of a filter.

In many instances the owners or operators were questioned relative to the use of lead protection, filters, etc., and in most cases the answer to these questions was "filters are a lot of applesauce." It is too bad, indeed, that x-ray laboratory workers are not instructed to demand adequate protection for both themselves and their patients.

A few general citations will be inserted at this point to illustrate the apparent carelessness with which many of the laboratories in question are operated.

Case one:

One laboratory visited is devoted to epilation. The office is maintained for cosmetic purposes, and men and women are subjected to x-rays that certain parts of the body may be made free from undesirable hair. In this particular laboratory filters are used. There is, however, no protection whatever provided for the technician. The operator, a woman, has already begun to show signs of excessive radiation. During the process of treatment (and they have a large practice) the operator is forced to be near the x-ray tube, and as result of excessive x-ray exposure the right eyebrow is practically destroyed.

The writer questioned this operator and was told that she had been assured by the physician owning the laboratory that no harm could come to her. She was perfectly safe! When cautioned regarding the eyebrow, and a possible damage to the eye, she retorted that the eyebrow was a good advertisement for the laboratory. She shows other signs of excessive radiation and is perfectly ignorant of the possible damage to which she is daily subjected. She also stated that one patient had received a violent reaction since she came into the physician's employ.

Case two:

Case number two represents observations of forty-eight laboratories. In many instances one man will own fro mone to four. This series is devoted to dental radiography exclusively. At least 30 of the laboratories in question operate at a T. S. D. 14 to 16 (and in a few instances eighteen inches with *no filter!* These laboratories report no skin damage to patients to date. It has been impossible, however, to make a scientific check to determine whether or not this information is correct. Without exception this series of laboratories is without protection. No lead screens, booths, or other type of protection is provided. The operators show evidence of excessive radiation.

Case three:

Another laboratory used for both radiography and therapy ,operated by a radiologist who should know better, has no protection for

the technician, and all radiography is done without a filter. In many instances a large number ot radiograms are made of each part examined, and it occurs to the writer that this manner of operation is a source of possible danger to the patient (as well as the operator).

It will bee seen that at least 60 of the 75 x-ray laboratories visited andl inspected are operating with the same apparent carelessness. There is no question but that this type of laboratory is a menace.

The question naturally arises, what constitutes adequate x-ray protection.

The answer to this question is a rather lengthy one. It may, however, be answered in two parts, namely: "Protection of the Technician" and "Protection of the Patient."

PROTECTION OF THE TECHNICIAN

The dangers of over exposure to x-rays are perhaps not all known. There are a few effects, however, which are commonly known, and for the purpose of providing the technician with adequate protection, it is well to see to it that such protective measures as are known, constitute the first consideration in the installation.

1. Over-exposure to the superficial tissues may result in permanent damage. One who is constantly operating an x-ray machine should never subject portions of his body to x-rays unnecessarily. It should not be required that the technician hold a member of the patient's body during exposure; neither should a dental film be held in the patient's mouth by the operator, nor is it at all necessary that the technician remain in the room with the patient during the time that a roentgenogram is being made.

2. Derangement or dysfunction of the internal organs, particularly the organs of generation, suffer changes easily, and such changes often go unrecognized until it is too late to repair the damage done.

3. Early changes are manifested in the blood, and the red cell count and hemoglobin should be checked at regular intervals.

Prevention.

There is an old adage, "an ounce of prevention is worth a pound of cure." This little saying holds good in this instance. The best cure is prevention—and prevention demands measures of protection for the operator if this factor is to be accomplished. After the damage is done it is too late for little more than bitter remorse.

1. All x-ray machines should be carefully calibrated. The technician should know the exact potential and current output at all times. This knowledge will eliminate undue exposure to the patient, and insure the duplication of desired results.

2. The installation of the laboratory should be such as to render the technician free from mechanical injury and electric shock.

3. The x-ray laboratory should be divided into sections, if possible.

(a) Room for radiographic work.
(b) Fluoroscopic room.
(c) A superficial therapy department.
(d) A deep therapy installation; and
(e) If research or industrial problems are attempted, a separate laboratory should be provided.

4. In all x-ray wor kthe tube should be as completely enclosed as possible. The protective material enclosing the tube should equal two millimeters of lead.

5. The technician should at all times be protected with a lead screen, preferably a lead lined booth, especially if any therapy is done.

6. Fluoroscopic work should be done in a dark but well ventilated room. The tube should be as completely enclosed as possible in a lead glass bowl (black) or lead lined box. The tube should be installed in such a manner as will render the operator free from electrical shock and stray radiation.

7. The screen should be fitted with glass of lead composition equivalent to one millimeter of lead.

8. The fluoroscopic technician should always wear rubber gloves and apron impregnated

with lead. The lead in these devices should equal one-half millimeter in thickness.

9. The minimum amount of x-ray exposure should be used in all fluoroscopic work.

In paragraph five mention was made of a lead lined booth. The construction of the booth should be such as to render it ray proof, and should be well ventilated and lighted. An exhaust fan should be installed if the booth is not provided with an outside window or some other source of ventilation.

Laboratories provided with a lead covered booth or room for the patient being treated or examined should have all control panels outside the treatment enclosure. All such rooms thus provided should have a lead protection of not less than two millimeters in thickness covering the walls and ceilings.

In deep therapy work, however, a large, well ventilated, well lighted room should be provided. The x-ray tube should be enclosed in a drum of some material, preferably lead lined, with only an aperture of sufficient dimentions to accommodate the work being done. Drums of this nature are provided with cooling devices to prevent overheating the tube. Deep therapy rooms should be provided with lead lining of walls and ceilings equivalent to three millimeters in thickness. All controls must be in a separate enclosure.

There are certain electrical precautions in an x-ray laboratory:

1. Concrete floors should not be used. If such floors exist they should be covered with some insulating material such as cork, rubber or wood.

2. All switches and controls should be care fully indicated. If possible, double pole switches should be used. Fuses, very little higher than required should be provided, and overload relay releases should be added to the various machines installed.

3. All wires should be stout and well insulated. Metal tubing should be employed in the high tension circuit as conductors.

4. When an x-ray laboratory is to be installed it is wise to have a physicist consult with the architect. It is not wise to repose too much confidence in the "x-ray salesman" in matters pertaining to protection from radiation. Such "information" as is advanced by various members of the selling staff of x-ray manufacturing organizations is very often most unreliable. The writer has visited a number of laboratories in which advice and information were furnished by the salesman, and in most instances the laboratories had very poor protection. Many physicians have been advised by salesmen that the lead glass bowl provided with the apparatus constituted adequate protection. Some laboratories have also been informed from the same source of information that lead screens are superfluous.

The lead glass bowl, however, is not adequate protection. The secondary radiation from the patient is of grave importance. In radiographic work a lead screen may suffice, but for therapeutic purposes a booth or room should always be provided. One physician was told that this is not necessary because clothing absorbs most of the secondary. This is not true. This fact can be proven by placing a dental film next to the skin, or deep in some remote pocket of clothing. If the machine is operated with 120 k.v. for a few minutes, and the film developed, it will be found to be almost black!

"Lead glass bowls" are not always lead glass. The writer has been in many laboratories supposed to be equipped with a bowl of lead composition which was not lead at all, but merely ordinary glass moulded to the thickness of the bowl which it was intended to imitate. There is one observation that will serve to make this problem always simple: If the bowl colors a deep violet, it is glass; if it colors a deep orange, it is lead glass.

It will be seen, therefore, that too much dependence cannot be placed in the bowl as a protective measure. Neither can too much dependence be placed in the word of all the men who have various types of apparatus for sale, because acting upon this so-called advice hundreds of young men and women are going to their destruction unprotected by this silent enemy of health.

In view of the fact that the technician is, after all, taking the constant risk for the radiologist—he or she in all instances should be granted the following concessions:

1. Eight working hours per day.
2. Sundays and one half holiday each week. This time should be spent out of doors in the sunshine.
3. One month's vacation during each year.
4. Pay the technician a living wage; he has earned it, and the radiologist can afford it.

PROTECTION OF THE PATIENT

The problem of chief concern from the patient's point of view is the "x-ray burn." The writer still prefers the term "over-exposure burn." At this day, and time, x-ray burns can be avoided, and should a burn occur, it is usually due to carelessness:

1. No filter.
2. Incompetent technician.
3. Improperly installed equipment.
4. Inadequate measuring instruments.
5. Placing too much confidence in the technician's ability to calculate x-ray dosage.
6. Lack of training on the part of the radiologist.

It is a well known fact that indiscriminate exposure to x-rays produces a severe erythema, and many times irreparable damage is done. In practice it is always advisable to expose the patient to x-rays as little as possible. The very minimum amount is sufficient. In x-ray therapy all parts—except the lesion being treated, should be well protected by lead foil. The dosage in all cases should be calculated and prescribed by the physician in charge. In no instance should the calculation of the dosage be left in the hands of the technician—such problems are not the technician's business; he is trained in technology, not medicine. It is quite possible that some of the disastrous mishaps, serious burns, etc., result from too much confidence being placed in the ability of the technical assistant.

The author has visited a number of laboratories in which the treatment work was left entirely to the discretion of the technician. Such procedure is undoubtedly a mistake, and in time serious damage is the inevitable result. Roentgen therapy is a serious proposition at best and the most skilled radiologist, always a physician, should be chosen to carry out the administration.

In no laboratory should radiography be done without a filter. The type of filter usually employed is one millimeter of aluminum. With the employment of aluminum filter only a minimum exposure should be given. This does not mean that one is not to do all the work on a patient that is necessary. The tolerance of the average patient is sufficient to allow for all the work necessary ,and more, with proper filtration.

The next question is: "How much exposure can be given the patient in radiographic work?" This question is easily answered, and just as easily calculated by simple arithmetic.

If the technician will devote a few hours study to the operation of a slide rule, see Fig. 1., no patient need ever have too much x-ray exposure. The basis for these calculations is laid down in MacKee's formula:

$$\frac{\text{Spark Gap} \times \text{Milliamperes} \times \text{Time in Minutes}}{\text{Distance (squared)}} = \text{S. U.}$$

Example:

$$\frac{6'' \text{ S.G.} \times 3 \text{ M.A.} \times 2 \text{ Min.}}{8'' \text{ (squared) Distance}} = \frac{36}{64}; \text{ or 1 S. U.}$$

Therefore:

2 minutes equals 1 S. U.
1 minute equals ½ S. U.
30 seconds equals ¼ S. U.
15 seconds equals ⅛ S. U.
NO FILTER.

TABLE NO. 1

	Films	Seconds
Upper Right Molars	2	14
Upper Rt. Bicuspids-Cuspids	1	5
Upper Rt. Cuspids—Centrals	1	4
Upper Lt. Centrals-Cuspids	1	4
Upper Lt. Cuspids-Bicuspids	1	5
Upper Lt. Molars	2	14
Lower Lt. Molars	2	12
Lower Lt. Bicuspids-Cuspids	1	5
Lower Centrals	1	4
Lower Rt. Cuspids-Bicuspids	1	5
Lower Rt. Molars	2	12
TOTALS	15	84

2.5" S.G. 30 M.A. 14 T.S.D. No Filter	84 Seconds = 1 2/5 Minutes. 1 2/5 Minutes = .95 S.U.

Two minutes is the erythema dose unfiltered. For filtered dose the time may be increased forty per cent for every millimeter of aluminum filter.

Let us take one of the visited laboratories previously referred to and calculate by means of our formula the dosage on the entire face for a complete denture. See Table No. 1. We observe that for a complete denture fifteen films have been used with a total of 2520 milliampere seconds. Applying the formula we find:

$$\frac{2.5'' \text{ S.G.} \times 30 \text{ M.A.} \times 1\ 2/5 \text{ Min.}}{14^2 \text{ Distance}} \div \frac{36}{64} = .95 \text{ S.U.}$$

True, the entire .95 S. U. has not been applied to any one area; but the entire face received a total exposure of .95 S. U., and that is entirely too much. Had a filter of one millimeter of aluminum been employed, the results would have been just as good, and the risk to the patient very much less.

The danger in this unfiltered technique lies in the personal element of the patient. There are many patients who become dissatisfied with their examination as soon as they have left the examining room. The patient then presents himself to the laboratory next door and is subjected to the same treatment, or a partial examination duplicating that which has already been done. Should the second laboratory not use a filter—serious damage may result.

Another point regarding exposure technique is that of having in mind the correct time for a given part under examination. It is well to have a technique chart worked out stating in a simple, concise manner the complete details. Reference to the chart will at once set aside all doubt as regards a given examination; and if the machine is accurately calibrated it will be a simple matter to duplicate results without subjecting the patient to undue x-ray exposure.

It is impossible to make a chart complete in all details, and at the same time compensate for all distances. However, if the chart is complete for a given setting, it is only a matter of elementary arithmetic to determine from the given setting what the time for the new setting should be.

There are a few fundamental facts that we must remember when dealing with x-rays:

1. Quantity varies as the square of the voltage.
2. Quantity varies as the milliamperage.
3. Quantity varies as the time.
4. Quantity varies inversely as the square of the distance.
5. Doubling the voltage quadruples the dose.
6. Doubling the milliamperage doubles the dose.
7. Doubling the milliamperage doubles the dose.
7. Doubling the time doubles the dose.
8. Doubling the distance gives one-quarter the dose.

The intensity of x-rays will vary inversely as the square of the distance from the target. If the distance is doubled the intensity will be one fourth; or if the distance is tripled, the intensity will be one ninth of the intensity at the original distance.

If a certain setting has been found to be the correct one and has been written on the chart, let us say using ten milliamperes of current, the exposure may be cut in half by increasing the current, to twenty milliamperes; and if forty milliamperes are used, the time will be one quarter of the original.

The technician who is having trouble with the time factor is advised to write to the Eastman Kodak Co., Rochester, N. Y. This company publishes a booklet "X-Rays" which makes very clear these simple calculations.

The following formulas have been extracted from this little book.

If with a given distance and current a certain photographic effect is produced with a three inch spark gap in ten seconds (for example), the exposure times necessary to produce as nearly as possible the same effect for two, three, four, five, and six inch spark gaps are:

2″ Spark Gap 30 seconds.
3″ Spark Gap 10 seconds.
4″ Spark Gap 6 seconds.
5″ Spark Gap 4 seconds.
6″ Spark Gap 3 seconds.

A few illustrations of the variation of the photographic effect with variation of these factors—spark gap, distance, current and time, will show clearly how these troublesome factors may be changed at will without any haphazard guessing.

Examples:

Distance—	20 inches.
M.A.—	20.
Spark Gap—	3 inches.
Correct time—	12 seconds.

Query (a): What will the exposure time be if the distance is changed to fifteen inches, and no other factors are changed?

Answer: The intensity varies inversely as the square of the distance; therefore, the relation of exposure times would be inversely as the squares of the distances, thus:

$$12 \text{ sec.} : \text{unknown or "X"} :: 20^2 : 15^2$$

$$\frac{12}{X} = \frac{400}{225}$$

$$X = 6\tfrac{3}{4} \text{ sec.}$$

The correct time at 15 inches is then $6\frac{3}{4}$ seconds.

Query (b): What would be the correct exposure time if the distance were changed to 30 inches?

Answer: The same square law would apply.

$$\frac{12}{X} = \frac{20^2}{30^2}$$

$$\frac{12}{X} = \frac{400}{900}$$

Therefore:

$$X = 27 \text{ seconds.}$$

The correct exposure would then be 27 seconds.

Examples (2). Conditions same an one.

Query (a): What would be the correct exposure if the current is doubled?

Answer: If the current is doubled consequently the time necessary would be only one half, that is, six seconds.

Examples (3). Conditions as in one.

Query (a): What would be the correct exposure time if the spark gap were changed to six inches?

Answer: If this were done, then the photographic intensity would change proportions as the spark factors for 3″ and 6″ in the preceding table.

Thus:

$$\frac{12 \text{ seconds}}{X} = \frac{10}{3}$$

$$X = 3.6 \text{ seconds.}$$

Query (b): What would be the correct exposure if the spark gap were changed to four inches?

Answer: The same relation as given above would hold.

Thus:

$$\frac{12 \text{ seconds}}{X} = \frac{10}{6}$$

$$X = 7.2 \text{ seconds.}$$

These are all simple factors that can be solved by any technician. The technician who will insist that every unknown factor be made a known one will find the reward well worth the effort.

In conclusion, it might be said that nothing new has been presented in this paper. Granted: It is only the desire to again call to the attention of x-ray laboratory workers the need of caution, and added protection. Therefore, with all good wishes to the technician who is blindly groping for facts—facts that will assist in better work, better protection, and better health, is this paper sincerely dedicated.

A paper now in preparation, "The Sphere Gap Voltmeter," will furnish a detailed description pertaining to the calibration of x-ray machines.

EDITORIAL

ARCHIVES OF PHYSICAL THERAPY, X-RAY, RADIUM

PRESENT METHODS UTILIZED IN PHYSICAL THERAPY INSTRUCTION

Instruction in physical therapy as conducted by some of the leading medical schools shows a definite lack of uniformity of methods. Some have adopted the inductive or laboratory-clinical method. Others, the exclusive clinical method in the broadest sense. Few have preferred the laboratory method alone, and some have reduced the course to a mere demonstration of technic. When the elacticity of instruction is so great it is well to analyze the entire situation. Certainly, not all the methods now employed can be ideal, or even practical. Logically, the scope of scientific physical therapy instruction depends upon three principles: (1) the method of instruction; (2) the facts relative to physical therapy; (3) selection of material for the demonstration of the principles deduced from the facts. This is the ideal—the scientific method. Unfortunately, expediency plays an important role in present day instruction. The instructor is always cognizant of unavoidable gaps in his courses, due, in most instances to overcrowded and rigid curricula.

The demand for selected material is frequently greater than the actual supply. Special instruments, very often expensive, are not always at hand even though the instructor is familiar with their use. A conservative faculty, slow moving to the demands of unproven innovations—all of this taxes the ingenuity, the patience and the tact of the enthusiastic teacher in this new discipline. These are trying circumstances. But let us not be disheartened, for one of the strongest factors of stability in progress is the inertness, nay, rather the active hostility, with which society receives all new ideas. It is the crucible in which the dross is separated from nebulous hypotheses. These conditions are the only extenuating circumstances that may force instruction in physical therapy to temporarily resort to any elastic measures beyond the pale of scientific method.

We look toward the future of physical therapy with optimism not based on faith or enthusiasm, but on the facts of its accomplishments. Laboratories of every outstanding university have at one time or another contributed to the new knowledge of its therapeutic value. The commercial and therapeutic possibilities of photochemistry, thermo and photo dynamics are today assiduously investigated in every outstanding school of learning. Chemistry acknowledges its dependency upon physics and the corelationship of both to the transformation of matter and energy. The recognition of physical therapy as a science lies in the growth of the acceptance of the unity of matter and energy. The human body is now recognized to be a chemical factory in which most complicated chemical and physical changes are continually taking place. "As physiologists," says Bayliss,* "our task is to refer, as far as possible, all phenomena of life to the laws of physics and chemistry." Prof. Julius Stieglitz** has stated that, "life in all its forms, from its beginning to its end, is the highest, most complex expression of the transformation of matter, and of the transformation of energy." The science of physical therapy is in agreement with the foregoing concept, and, because of this, it is clearly to be appreciated that the teaching of physical therapy embodies a wholesale problem.

In which way can the instructor best expand this knowledge? This can best be taught by the scientific method, which means that instruction must be based on a clear knowledge of facts, as well as on an appreciation of their sequence and relative significance. Any generalization which is based on unsound or unproven theories should be as much taboo in the discipline of scientific physical therapy as it is in any other division in science. Such a method is the

antithesis of the scientific method, and is usually founded upon an analysis which does not start with the classification of facts, but reaches its judgments by some obscure process of speculation. Such a method usually takes on the name of philosophy. It leads to competing and contradictory systems, and ends in obscuratism.

Conversely, the scientific method, independent of the size of the material at its disposal, carefully and accurately classifies its facts and observations, their correlation and sequence. Its rigid rules impose the necessity for self criticism and the testing of the validity of the method and of the facts therein in a manner understandable to all students. A few principles thus learned will be more lasting, impressive and longer remembered, than the attempt of futile cramming by any other means. This plan is well established and universally accepted as a part of scientific pedagogy, a method essential for ideal physical therapy teaching. —D. K.

*Introduction to General Physiology, by Sir William Bayliss (1919).

**Chemistry in Medicine, Stieglitz and others; Chemical Foundation of America, Publishers (1928)

ROBERT KNOX

The sudden death of Robert Knox on September 21st is a depressing shock to all of his many friends the world over, and an untimely loss to the medical profession. He was an indefatigueable worker in the field of medical radiology, and won distinguished honors by virtue of outstanding research and timely contributions. His was a genial and democratic personality. We recall his many acts of kindness, his broad humor, his patience in moments of trial, and his deep tolerance. The editorial column of the British Journal of Radiology, of September, 1928, summarizes some of the essential qualities of this man:

"British radiology has suffered a sudden and grievous loss in the untimely death of Dr. Robert Knox on September 21. A worker of international reputation and in the very front of his profession, he had received many recognitions and distinctions. No man ever held higher ideals for his profession, and so worthily tried to live up to them. His sound, constructive work for the Roentgen Society, for the B.A.R.P., for the Society of Radiographers, for the Therapeutics Section of the Royal Society of Medicine, and for the British Institute of Radiology, was of invaluable service to the science he loved so well. As editor of this journal for many years, he guided its progress through fair weather and foul, and almost single-handed brought it to its present position. It is well known that the International Congress of Radiology owes its origin to his initiative and pertinacity. His famous book on Radiography and Radiotherapeutics is recognized the world over for its scholarship and comprehensiveness.

"Knox's freedom from prejudices, his modest and kindly disposition, his humor, his charitable outlook, his freedom from self-advertisement, and his capacity for genuine friendship, combined to give him a unique and authoritative position in radiological circles. A past president of the Roentgen Society, and senior vice-president of the Institute at the time of his death, he enjoyed the affection and esteem of all classes of members. His loss at this juncture to the Institute is, indeed, well-nigh irreparable. Knox's memory will always be a precious thing to those who had the privilege of his close friendship. The deep sympathy of the Institute goes out to his widow and family in their loss."

We in America join in grief with his British colleagues and express our deep sympathy to his widow and family in their bereavement.

—Disraeli Kobak, M.D.

PHYSICAL THERAPEUTICS

At its recent annual meeting the American Electrotherapeutic Association concluded the purchase of "Physical Therapeutics" from its former owner and editor, Dr. Wm. Benham Snow, who had so stoutly and learnedly conducted its affairs for over twenty-five years.

The Association, through its newly appointed editorial board, viz., Drs. A. B. Hirsh, F. deKraft, R. Kovacs, Wm. B. Snow, C. C. Vinton and F. T. Woodbury, plans to enlarge the contents of the journal and enhance its value to the general medical profession.

The distinguished list of collaborators will be extended and items of interest and value from all quarters of the globe may be expected from them.—Frank Thomas Woodbury, M.D.

TREES X-RAYED

Internal ailments of trees, like those of human beings, are now diagnosed and studied with the help of x-ray photographs. Recent experiments by Mr. Rex Wilsey, of the Eastman Kodak research laboratories, show that x-ray photographs will disclose decay within a tree trunk which outwardly is sound. The accepted ways of testing trees are such as tapping with a mallet or boring with an auger. These methods, however, are not always trustworthy. But x-ray photographs distinguish clearly between the sound wood and the decayed parts; they also show knots and cavities. Even the type of decay which merely lessens the strength of the wood is shown. The x-ray tests were first undertaken after an apparently healthy tree had fallen in a street. The x-rays will be of decisive use in ascertaining whether a tree standing near traffic is free from hidden defects.—Derby Daily Press, June 23, 1928. Reprinted from the British Journal of Radiology, Vol. 9, Sept., 1928.

EMISSION OF RAYS BY PLANT CELLS

The discovery that the apex of certain rapidly growing vegetable and animal tissues emits some sort of invisible radiation which has the power to stimulate the growth of living matter with which it is not in contact, was first announced in 1924 by Prof. Alexander Gurwitch of Moscow; it has now been confirmed by German investigators. Gurwitch found that if the tip of one of the rootlets of an onion or turnip was fixed so as to point at right angles to the side of another root, though as much as a quarter of an inch away, the cells in the side nearest to the tip would multiply more rapidly than elsewhere and so bend the root away. That this influence was not due to the emission of some gaseous emanation from the root tip was proved by the interposition of a thin sheet between the two roots. Glass and gelatin sheets stopped the transmission of the growth stimulating power, but quartz did not. This is characteristic of ultraviolet rays, and Gurwitch concluded that the radiation from the root tips had a wavelength of 180-200 millimicrons, which would place it among the ultraviolet rays of high frequency.

A German botanist, Herr N. Wagner, has repeated the experiments and measured the effect by counting under a microscope the number of new cells produced in the roots acted upon. The increase is as high as 70 per cent in some cases. Old cells that have ceased growing show the greatest relative increase. The Siemens Electrical Company has taken up the question, and Doctors Hauser and Vahle report that certain growing animal tissues, such as cancer, emit such rays.

These results, if confirmed, will radically revolutionize present theories of life and growth. It has hitherto been assumed that the impulse to cell subdivision was, somehow, due to the direct contact of certain chemical substances transmitted through the tissues, but it now seems that an energy agency is active in vital processes, an immaterial radiation of the nature of light, but at too high a frequency to be detected by human eyes.—Science. Reprinted from British Jouranl of Radiology, Vol. 9, Sept., 1928.

A NEW JOURNAL OF ACTINOTHERAPY

A new monthly journal, which should prove interesting to members of the medical profession who wish to keep in touch with the latest developments in artificial sunlight therapy, medical radiology and electrology, will be published on October 1, entitled "The Actinic Practitioner and Electrotherapist." The first number will contain many instructive articles by leading authorities, including Drs. Howard Humphris, Edward Jas. Deck, Leila Keatinge and others.

The price of the journal will be sixpence. The publishing offices are situated at 139 High Holborn, London, W.C.1.

THE STUDENT'S LIBRARY

BOOKS REVIEWED

ELECTROTHERAPIE par *W. Vignal,* Electro-Radiologiste des Hospitaux de Paris; 544 pages with 179 illustrations in the text and 10-motor point plates at the end. Gaston Doin & Co. Publishers, Price 32 francs.

No other form of therapy is today in greater need of a better understanding of its fundamentals than is electrotherapy. Here is a book that devotes a good part of its valuable space to electrophysics and electrophysiology. In its text is included an exposition of high and low frequency currents. Galvanization and faradization and galvano-faradization is exhaustively expatiated upon. The author has dealt with his material in a concise and clear style. Each page shows evidences of wide personal experience, and is frequently strengthened by references to the even larger experiences of authoritative and contemporary investigators of his own land. It is to be regretted that lack of space will not permit the reviewer to discuss each section of this book in greater detail. Much inspiration as well as sound information is to be gained from its perusal and study. Medical and surgical diathermy for example, is discussed from every possible angle, such as its physics, physiology, its mechanics, and the variation of effect that follows changes in physical structure of the instrument. Indeed the entire section is extremely well written and shows no ear marks of padding. To the student of of diathermy, or better high frequency therapy, this or any other part is worth the price of the book.

In the section called Electrotherapy Practice the author stresses the practical value of the various agencies utilized. Here, as in the theoretical section, the author is brief, concise and informative. He has included in this section a chapter on electrodiagnosis whose study and application opens up neglected possibilities. This is an outstanding book on electrotherapy. Its translation into the English language is urged, for it is deserving of a wider clientel.

LEITFADEN DER ELECTROTHERAPIE, *von Dr Fritz Kraus,* Assistant fur Physikalische Therapie an Der Deutschen Psychiatrischen Universitatsklinik in Prag. Pp. 47. Price 2.80 Reichmark. Julius Springer, Publisher, Vienna, 1928.

This small book suffers from certain literary sins of omission and commission. It attempts to survey in the space of 47 pages the principles of some of the outstanding agencies in electrotherapy. The author includes in his theme high frequency currents, galvanism, faradism, sinusoidalism, phototherapy and its subdivisions of infra-red, visible rays, ultraviolet rays and x-ray therapy. The average writer, no matter how strong his literary urge, would be awed at the magnitude of his undertaking, and thoroughly discouraged at any attempt to abbreviate the mass of existing information into the space of 47 pages.

That he has succeeded in a fair measure speaks for the fact that the author is thoroughly conversant with the subject. The author has however, sacrificed a tremendous amount of essential material in order to gain this objective. Because theory and fundamental facts have been sacrificed for clinical data this volume will have a greater appeal for the physician already conversant with the subject than for the beginner. The author has not attempted to cover all of the conditions that can be influenced with physical measures. He has, however, outlined clear indications for the application of certain physical agencies, and the value of adjuvant soft x-radiation. It is clear that the value of this small volume is not in what the author has failed nor in what he has included, but in the fact that it is a reflection of the experiences of a pioneer. In this restricted sense it can be read with some profit by those already conversant with the subject.

DIE DIATHERMY, *von Dr. Joseph Kowarschik,* Primararzt Und Vorstand Des Institute Fur Physikalishce Therapie Im Kraunkenhaus Der Stadt Wien in Lainz; Sechste Verbesserte Auflage; with 125 illustrations. Sixteen R. M. Julius Springer, Vienna and Berlin, 1928.

This book was written by an outstanding pioneer and investigator of physical therapy. One naturally would anticipate a comprehensive, detailed and intelligent exposition on a subject in which the author is so profoundly oriented. In this the critical reader will not be disappointed. Its popularity and appreciation is attested by the fact that although it deals with a subject that is either superficially comprehended or hostily apprehended it has passed through, in a very short period, to the present, thoroughly revised sixth edition. The objective of this treatise is not merely to make of it a more popular exposition to electrode application, but rather to develop in its philosophy a greater appreciation of the fundamentals of thermodynamics, and its practical application to disease. The author therefore reviews in a comprehensive manner, the historical development of diathermy, its electrophysics and certain laws of thermodynamics associated in its study. The effect of high frequency currents on living structure is thoroughly surveyed and electrophysiology has received detailed consideration to the length of a full chapter. The technic of electrode application, the effect of the d'arsonvalization, direct and indirect diathermy and the logic thereof, together with the limitation and the usefulness of each method, has been gen-

erously explained within its pages. The clinical section of this treatise contains many valuable suggestions that reflects the rich experiences of the author. Here is a book that reflects authoritative experience in diathermy and its allied subjects. It is comprehensive and intelligent. Its style is dignified, and its tone conservative. It attempts to guide and teach the student and practitioner, rather than forcibly convert or sell him to its possibilities. It is one of the outstanding German contributions to the literature of diathermy, and its translation into the English speaking language is invited.

INTERNATIONAL ABSTRACTS

Fortschritte auf dem Gebiete der Roentgenstrahlen, 37: (June) 1928.

Encephalographic Material of Chronic Epidemic Encephalitis. L. Omorokow and A. Wischnewsky, Tomsk, Siberia—p. 823.

Para-articular Ossification in Disease of the Nervous System. W. Lasker—p. 830.

Tuberculosis of the Spleen and its Roentgenological Demonstrability. A contribution to the Knowledge of Haematogenous Spread of Tuberculosis in Childhood. W. Courtin and J. Duken, Jena—p. 836.

Congenital Subdiaphragmatic Dystopia of the Caecum. Hrabovsky, Debreczen—p. 840.

A Rare Case of Bursiitis on the Hip. Ehrlich, Cologne—p.847.

Intra- and Extra-articular Lipoma of the Knee Joint. Campbell, Dresden—p. 852.

On the Terminal Stages of Chronic Polyarthritis and the Associated Protrusio Acetabuli. D. Campbell. Dresden.

The Technic of the Use of the Contrast Enema. Mahlmann, Aix—p. 858.

A Case of Echinococcus Disease of the Spleen. E. Hell, Speyer—p. 862.

Importance of Repetition of the Roentgenological Examination in Trauma. Lindemann, Wernigerode—**p. 863.**

The Ballistic Milliamperemeter. H. Chantraine, Betzdorf—p. 865.

Calcification of the Nucleus Pulposus. F. Giongo, Milano—p. 873.

Summary. Fritz-Jochen Laux, Berlin-Lichtenberg—p 876.

A Case of Melorheostosis, (Osteosclerosis, Osteosis eburnisans Monomelica, Osteopathia hyperostotical) B. Valentin, Hannover-Kleefeld—p. 884.

The Triangular Bone of the Hand. (os triangulare) P. Esau, Oschersleben-Bode—p. 889.

The Roentgenological Recognition of the Esophageal Varices. G. Wolf, Berlin—p. 890.

A Case of Bony Bridging Between Scapula and Clavicle. Heupke, Frankfurt—p. 894.

Shifting of the Mediastinum in Scoliosis, of the Vertebrae Column. E.Zdansky, Vienna—p. 897.

A New Procedure of Marking Films. St. Simon, Vienna—p. 906.

Fortschritte auf dem Gebiete der Roentgenstrahlen, 38: (July) 1928.

The Indications for Artificial Pneumothorax With Consideration of the Modern Teaching and the Classification of Pulmonary Tuberculosis. K. Schilling, Freiburg.

On the Question of the Motility of the Vermiform Appendix. Max Cohn, Berlin—p. 26.

A Roentgen Study of the Muscular Structure and Muscular Tone of the Normal and Diseased Stomach. Max Zehbe, Weimer—p.38.

The Secondary Radiation from the Air. W. Rump, Erlangen—p. 58.

The Study of the Profile View of the Mitral Stenotic and the Heart of Mitral Configuration. S. Dedic, Beograd—p. 68.

Pneumo-Relief of the Stomach. F. Hilpert, Ludwigshafen a. rh.—p. 80.

The Significance of the Artificial Pneumothorax in the Diagnosis of the Intrathoracacal and Specialment Mediastinal Tumors. R. Lenk, Vienna—p. 88.

A Typical Form of Lumbosacral Osteochondropathy. Barsony, Budapest—p. 92.

Roentgenograms of the Anterior Chamber of the Eye without Bone Structures. H. Stoffel, Vienna—p.96.

Does Oxycephalus Reduce the Size of the Ventricle and Decrease the Amount of Cerebro-Spinal Fluid? Dr. Winckler, Bethel—p. 101.

A Simplification of Cholecystography by the Use of Sodium Cholate Felamin. Foerster and Libermann, WurtzBurg—p. 104.

Protection Against Secondary Radiation in Fluoroscopy. A. Bernstein and Klose, Danzig-Langfuhr—p. 107.

Fortschritte auf dem Gebiete der Roentgenstrahlen, 38: (August) 1928.

Roentgen Protection of the Physician and His Personelle. Chantraine and Profitlich, Betzdorf—p. 121.

The Diagnostical Value of Associate Roentgenologic Changes in Hypophyseal Tumors. Erdelyi, Budapest—p. 280.

Roentgen ray Stereoscopy in Relation to Optic Physiology. W. Barth, Wolfen., Kr.—p.299.

A New Roentgenologic Method of Examining the Colon. Relief Demonstration of the Mucosa of the Colon by Means of Umbrathor. H. Kalkbrenner, Leipzig—p. 325.

The Sella Turcia in Infants. Its Normal Development and Its Relation to a series of Abnormal Conditions. A. Steiert, Zurich—p. 339.

A Rare and Roentgenologic Noteworthy Case Demonstrating the Cause of Backache. (Claspformation resulting from spondylitis typhosa) S. H. Rummel, Wurzburg—p. 348.

On Certain Relations Between the Histological Changes and Roentgenographic Findings in Chronic Passive Congestion of the Lungs. H. Rosenhagen, Hamburg—p. 353.

Roentgenotherapy in Trachoma. N. S. Linowitz and G. G. Salzmann, Smolensk—p. 359.

The Roentgenographic Joint Changes in Osteo Chondo-Arthritis. M. Michailow, Moskau—p. 354.

The Interpretation of Circular Shadows in Roentgenology. H. U. Albrecht, Frankfurt—p. 367

Accurate Localization of Intrathoracic Cyst in Infancy. D. Orosz, Pec's—p. 371.

Innovations in the Roentgen Industry. Gertz, Recklinghaussen—p. 374.

Fractures of the Epiphyses of the Lumbar Vertebrae in Childhood. E. Lyon, Koln—p. 376.

Fortschritte auf dem Gebiete der Roentgenstrahlen, 38: (September) 1928.

Prepyloric Ulcer. The author summarizes his experience. M. Zehbe, Weimar—p. 461.

1. Even when there are only transient symptoms of spasm of the pylorus there was found, in 60% of the cases, direct signs of disease localized to the prepyloric area. In the remaining 40% of the cases a diagnosis was made in two cases and confirmed by operation. The diagnosis here was made by consideration of the functional symptoms and the finding of localized pain on palpation and pressure over the pyloric region.

2. Prepyloric ulcer has distinct roentgenological and clinical signs and symptoms which distinctly differentiates it from an ulcer in any other part of the stomach.

The Most Frequent Anomalies of the Upper Lumbar and Lower Dorsal Vertebrae. A. Schertlein, Halle—p. 478.

The influence of Roentgen rays on Tuberculose lesions of the Lung. R. Gassul. Kassan and S. Sandberg, Leningrad—p. 488.

The authors undertook clinical experiments on teritary, slow progressing, tubercular pulmonary lesions, the purpose being the best form of roentgen therapy as applied to tuberculosis of the lungs. Preceded by three to four weeks of continuous observation of the patients, they were treated with the following technic.

Focus skin distance 50 cm., one area was treated anteriorly posteriorly or laterally (the area being 400-625 sq. cm). The apparatus used was a Neo-Intensive Reform, 180 kv. Coolidge tube, filtration 0.5 mm. Zn. plus 3 mm. Al., 4 ma., single doses varying between 5 and 10% erythema. The clinical changes were graphically recorded and were checked up with each other before, during and after the treatment. Out of 100 cases there were only 15 chosen as suitable for the experiments. The cases thus chosen were studied with reference to the blood picture, sedimentation tests and immunilogical reactions.

Results: Reparative processes could already be determined after 5-10& HED. Following this the lesions recurred in some cases while in others the patients continued to improve. Cases with consolidation were unsuitable for roentgentherapy. Alleviation of pain following the treatments was a constant phenomenon. The radiation effects were always better when the periods between the treatments were prolonged. It was also possible to treat ambulatory cases. By repeated irradiations with a high depth dose the production of consolidations must be kept in mind.

On the Question of the Cardia Portion of the Stomach Forming a Diaphragmatic Hernia. H. Engels, Berlin—p. 500.

Small Roentgenologically unrecognizable aneurysms of the Aorta. A. Zeitlin, Moskau—p. 514.

Partial Paralysis of the Diaphragm. A. Herzog, Mahr. Ostrau-WitKowitz.

On Direct Roentgen ray Diagnosis of Perinephritic Abscesses. V. Revesz, Budapest—p. 526.

On Photography with Infra-Red Rays. J. Plotnikow, L. Splait, M. Piantanida, Zagreb—p. 526.

In view of the differences in penetrating power of the heat rays (infra-red rays) and their absorbability it is possible to activate photographic plates and thus it would be possible to utilize these rays in medical, criminalistic and technical sciences. They could be utilized as an adjunct to roentgenography.

Congenital Transposition of the Heart to the Right with Normal Position of the Abdominal Organs. F. Loeben, Rosbach-Sieg—p. 553.

On the Question of the Ovaries and Result on the Offspring. A. L. Kaplan, Moskau—p.556. The author describes three cases which received roentgen ray therapy on the ovaries. Two cases were irradiated before the onset of pregnancy and the third case, leukemia, was pregnant and the embryo also received radiation. The pregnant cases went the full term and were delivered of healthy infants. The leukemic cases had to go through the induction of labor and craniotomy had to be done on the infant. Microscopic and macroscopic examination of the infant showed it to be normal. The mother stood the operation very well and made an uneventful recovary. She died, however, of leukemia subsequently. The question of the relationship between leukemia and pregnancy and the transmission of the leukemia to the infant is discussed. The author concludes that the theory of the destructive effect of roentgen ray in the ovaries and embryo is not true for all cases.

Roentgen Therapy of Climacteric Disturbances. A. Kaplan, Moskau—p.565.

Twenty-five cases presenting symptoms of climacteric disturbances received deep roentgen therapy over the pituitary body. Only three cases did not react to the treatment. Two portals of entry were given over the temporal region. The dose was six H with heavy filtration.

Extensive Symmetrical Malacia in the Region of the Carpal Bones. P. Esau, Oschersleben-Bode—p. 381.

The present roentgenologic methods of examining the colon gives us very little information about the colon-mucosa. The new contrast substance, Umbrathor, is a colloidal thorium X preparation which is deposited and coats the mucosa of the colon It is manufactured by the firm von Heyden (Dresden-Radebeul) Mode of action. The mucosa of the colon produces a secretion which is composed of biocolloids and electrolytes. Both substances have characteristics in common , i.e., they carry an electric charge. The biocolloids are negatively charged in neutral and alkaline medii. The charge of Umbrathor is positive and therefore attaches itself to the negative charged colloids of the colon mucosa, producing a deposit on it. The degree of electric charge of the biocolloids of the mucosa is directly proportional to the hydrogen ion concentration and the state of the iso-electric point of the medium. The iso-electric point differs in the mucous secretion of the normal mucosa and the plasma substance of tumors. It is therefore possible to obtain a relief picture to differentiate between inflammatory and ulcerating lesions. The roentgenogram gives us at the same time information as to the physico-chemical structure of the mucosa. The diagnostic significance is clinically demonstrated in two cases. Proctitic and Ulcerative colitis.

Ultraviolet Irradiation of Primates with the Form of Cage Paralysis Resembling Rickets. Chas. B. Noback, Jour. Amer. Vet. Med. Assn.

Noback reports successful results following the application of ultraviolet irradiation in five monkeys with cage paralysis. Dietary factors plus lack of natural ultraviolet rays are believed to be the chief factors producing this condition. The characteristic symptoms are progressive weakness of the posterior extremeties with final paralysis, and a stiffness resembling rheumatism. In general, the animal is listless, the hair becomes rough, loses its luster, refuses to move about, and eventually dies of pneumonia or enteritis. The therapy applied to a red howler monkey, which is notoriously difficult to raise in captivity is interesting. Direct ultraviolet therapy was initiated on February 9th, 1927—exposure distance of 24—inches for a period of fifteen minutes daily. In three days the time of exposure was lengthened to thirty minutes, and continued thus until March 11, 1927. The first change noted was in the condition of the hair which became smooth and glossy; at the end of the second week he moved a little more easily and the hair showed further improvement. Progress thereafter was quite rapid. Irradiation was then given indirectly by exposing dried milk (Klim) for thirty minutes at a distance of 12 inches according to the technic of Hess for cholesterol. The irradiated milk was continued thereafter and eventual restoration of the normal diet for this animal.

The British Journal of Radiology. New Series. Vol. 1., No. 9—September, 1928.

Protection and Working Conditions in X-Ray Departments. G. W. C. Kaye, O. B. E., M. A., D. Sc.

Multiple Hydatid Cysts of the Lung. Case Report. J. H. Mather, M. B., Ch. B., D. M. R. E.

The Pulpless Tooth. James E. Brailsford, M. D.

A New Departure in X-Ray Technic. A. Salmony, M. D.

Dr. Gottheiner, of Berlin, has recently perfected a method in x-ray photography. By fluorescent screens he is able to increase the length of the x-rays and convert these into simple light rays of many thousand times longer wave length. The effect from this fluorescent screen is to reduce the image to 1 inch by 3/4 inch in size. This method will be of great value in moving picture film demonstrations of internal organs. The very great importance of being able to reproduce the movements of, for example, the heart and intestinal tract, is self-evident, as is also the value of such films for the illustration of lectures and teaching purposes. It will also become possible to study certain early functional disturbances such as early carcinoma of the stomach. The cost of such film reproduction compared to that existing today will be reduced 99%.

The Cancer Problem. James F. Percy, M. D., Southwestern Medicine. Vol. XII, No. 9, Sept., 1928.

The practical phases of the problem of cancer therapy should concern itself more with the effective method of its management rather than the elusive chase for its cause. While the etiology of this disease may still be debatable its treatment is well established. The difficulty in its eradication is the early recognition of the disease and the tendency of its victim to mask or hide his status from his fellow men until he reaches the terminal stage. Early cases are easily curable if the proper surgical measures are utilized. The cautery method is the best agent in both the early or late accessible and inaccessible types. In the hopeless cases it is palliative, gives relief from pain, and prolongs life. The cold knife is strictly contra-indicated for it opens up avenues for cancer cell dissemination. The objective in malignant conditions is to cauterize the entire growth, destroy the mass and seal all the lymphatics and other possible channels. This operation is of necessity a radical one, but it holds out the greatest benefits. "Heat is the poison that invariably kills cancer." The anesthetic is of considerable importance. The growth is either excised or coagulated *in situ*. In attacking surface cancers the author outlines the position by drawing about the growth a hot knife. The skin is cut from within out to permit greater heat dissemination as well

as better coaptation and union of skin. Any mass over 2.5 cm. should be dissected out with the cautery knife. Less than this should be cauterized by a ball tipped heating iron. As a check and guide to the operation, biopsy is of extreme importance. These biopsies should be made with the cautery knife. Regrowths should be watched for and destroyed in the same manner at the earliest moment. The operative mortality is no greater than in ordinary operations.

Clinical Experience with Irradiated Ergosterol. A. F. Hess and J. M. Lewis, J. A. M. A. 91: 783-788, Sept. 15, '28.

Irradiated ergosterol is by far the most potent of the antirachitis agents. It is an absolute specific. Cod liver oil in the amount in which it can be given is a specific of limited dependability—only moderately effective for the average infant, uncertain in action for the rapidly growing infant, and ineffective for the premature. Irradiated ergosterol is quite as valuable in tetany as in rickets and in both disorders is remarkable for the rapidity as well as for the reliability of its action. As yet the authors have not sufficient clinical experience to define its proper dosage. Furthermore, the various preparations cannot be evaluated, as they have not yet been assayed on the basis of the number of "curative units (rat)" which they contain. The amounts now recommended and employed are unnecessarily high, as shown by the fact that they induce an excess of calcium and inorganic phosphorus in the blood in the normal as well as in the rachitis infant—hypermineralization. Too great emphasis has been laid on rapidity of action. It would seem advisable, before distributing unreservedly to the medical profession this potent concentrate, to make more thorough clinical study of its dosage, as has been done in regard to other potent extracts. In view of its reliability, its high degree of activity and its ease of administration, irradiated ergosterol should prove a most valuable addition to our rapidly increasing fund of specific antirachitic agents.

Symptomatology of Vitamin B Deficiency in Infants. B. R. Hoobler, J. A. M. A. 91:307-310, Aug. 4, '28.

From personal observation and from reference to various sources in the literature, I have been able to compile a list of the symptoms of outspoken cases of infantile beriberi as it occurs in the Philippine Islands.

It is conceded at the outset that such outspoken cases do not appear in infants of the United States, but in the present American diet there is a partial deficiency of vitaminB in the diets of nursing mothers and of infants artificially fed on cow's milk, sugar and cereal mixtures that may cause profound systemic changes which, in the course of development, may produce symptoms analogous to those of a complete deficiency.

A group of symptoms, appearing in infants believed to be on diet partially deficient in vitamin B, were caused to disappear on the addition of brewers' yeast concentrate in suitable quantities to the diet without any other change being made.

This symptom complex consists of (1) anorexia; (2) loss of weight; (3) spasticity of the arms and legs; (4) rigidity of the neck and (5) restlessness and fretfulness. Pallor and a low percentage of hemoglobin are accompanying symptoms.

An infant whose diet is deficient in vitamin B is pale, undernourished, fretful, restless, whining and spastic, and consistently refuses to take all of its food.

Radium Statistics of Carcinoma of the Cervix Uteri. G. Gray Ward and L. K. P. Farrar, J. A. M. A. 91:296-299, Aug. 4, '28.

After the first irradiation in carcinoma of the cervix, every patient should be examined each month for a period of at least five years, and as much longer as possible.

Repeated irradiation, when needed, checks the extension of carcinoma.

A daily douche and care of the general health are necessary adjuncts for a cure.

The lacerations of childbirth should be repaired immediately after confinement.

A standardization of statistical reports on irradiation of cancer of the cervix is necessary for a comparison of results in different clinics.

Reports on irradiation of carcinoma of the cervix should give: (a) Results after five years in all cases treated, including both early and advanced carcinoma of the cervix. (b) Results after five years in all cases treated, when the carcinoma is primary and confined to the cervix, for comparison with cases treated surgically. (c) Operability and primary mortality.

We believe that the statistics today show that in irradiation of early carcinoma of the cervix there are just as good results to be obtained as in the radical operation, with less primary mortality and less morbidity.

Irradiation of the Ovaries and Hypophysis in Disturbances of Menstruation. D. G. Drips & F. A. Ford. J. A. M. A. 91:1358-1364, Nov. 3, '28.

The continued study of a group of cases of primary obligomenorrhea and amenorrhea and of menorrhagia and metrorrhagia has confirmed the impression of an essential ovarian hypo-activity in both conditions.

The occurrence of spontaneous remissions and the variable results with all forms of treatment and difficulty to the evaluation of a new method.

Low dosage irradiation of the ovaries or hypophysis offers an additional therapeutic measure in intractable cases. The low dosage irradiation has given a comparatively high percentage of favorable results in view of the severity of symptoms in the cases in which it has been used, and regulation, when attained, has continued over a relatively long period.

In experimental studies which are still incomplete, an attempt was made to gage the amount of roentgen

rays for application to the ovaries of white rats which might be comparable to low dosage irradiation in the human being. Certain immediate variations in the estrual cycle without disturbance of late regularity were obtained. In most instances fertility was not affected. The second and third generations of the irradiated rats were normal. It was not possible to demonstrate precocious sexual development of immature rats by irradiation of the hypophysis with varying amounts of roentgen rays.

Fractures of Metacarpals and Phalanges. P. B. Magnuson, J. A. M. A. 91:1339-1340, Nov. 3, '28.

Fractures of the metacarpals and phalanges are capable of producing disability far in excess of their apparent importance, because they are components of an important member, and if not properly replaced and maintained in position they become a serious handicap to the number of which they are an important part.

Antagonism of Growth and Sex Hormones of the Anterior Hypophysis. H. M. Evans and M. E. Simpson, J. A. M. A. 91:1337-1338, Nov. 3, '28.

Two hormones are secreted by the pars anterior of the mammalian hypophysis, one required for normal growth and the other for normal development of the gonads, thyroid and supraenal cortex.

As regards its effect on the sexual system, the second hormone can be completely nullified by simultaneous administration of the first—the growth substance. Evidently nature has provided the necessary nice adjustment in the relative amounts of the substances secreted. That the growth of animals is usually accomplished before the attainment of sexual maturity may therefore plausibly be due solely to the early predominance of the growth hormone.

Our experiments are in conconance with the identification of the two hormones of the anterior gland from the basophilic and the eosinophilic, two sharply separated cell types.

Electrocoaguation and Ultraviolet Light as Adjuncts to Surgery. A. D. Willmoth, Hosp. Progr. 9:444-446, Nov., '28.

The author gives the following definition for electrocoagulation: "Electrocoagulation is the coagulation or cooking of tissues by surgical diathermy as is produced by a biterminal high frequency current of the d'Arsonval type, utilizing a multiple spark gap."

Since electrocoagulation is a surgical operation it should not be employed by anyone who is not skilled in this line. One of the most important factors in successful electrocoagulation is to have a foot switch on the machine to control the current. The advantages and disadvantages of high frequency current are outlined by the author. Electrocoagulation is especially preferred in cancers on the surface of the body and in the neck of the uterus. It has also proven very satisfactory in the removal of carbuncles. Some points in its favor in this operation are, that there is no bleeding, shock nor pain and that one has the least amount of scar following the operation.

Rollier, Steenbock, Hess and Vobie have had wonderful success in employing ultraviolet light. From the results of these noted physicians, it is to be expected that the medical world will look upon this type of physical therapy as one which will accomplish much good.

By the use of photosensitive agents, the rays will carry into cavities which could not otherwise be reached. Especially are these photosensitive solutions helpful in sinueses leading into the abdominal cavity, ulcers and open wounds.

Dental X-Ray Findings. S. D. Whitten, Texas State J. Med. 29:39-41, May, '28.

The indications for using the x-ray in orthodontic practice may be summarized as follows: (1) as a means of determining the presence or absence of unerupted, permanent teeth before treatment is undertaken; for most patients requiring treatment have a mixed dentition and such a radiogram gives the operator an opportunity to determine the presence or absence of unerupted teeth.

As a means of determining the approximate size of the unerupted teeth for which space must be made in the arches. The roentgenogram can be made to show quite accurately the amount of space that it will be necessary to prepare for the unerupted teeth.

To determine the state of development of unerupted teeth, tardy in their eruption.

To determine the approximate direction in which the teeth are erupting, and the relationship which they will bear to the line of occlusion when erupted. When decidious teeth have remained in the mouth a longer period than normal, and when the roots have been absorbed, the erupting permanent teeth will sometimes be deflected from their normal course. It is therefore necessary to know the direction in which they are deflected so that retaining appliances may be properly applied.

As a guide, when necessary, to make attachments to unerupted teeth to aid in their eruption.

To determine the most opportune time for the extraction of decidious teeth. When such teeth remain longer than the normal time, it is advantageous to determine the extent of absorption of the roots as well as the development of the successor so that the developing tooth will not be injured in the extraction.

To observe the roots of the teeth and their relationship to other roots and structures. It is important in young subjects that the roots do not encroach upon each other or upon other teeth.

To determine the relationship of the developing third molar to certain recurrent malocclusions, that steps may be taken to prevent these teeth from becoming a cause of malocclusion during their first eruption. The pressure exerted by a developing lower third molar is often sufficiently great to cause a crowding of the lower incisors and cuspids.

To observe devitalized teeth prior to eruption; to determine their fitness for eruption from the standpoint of anchorage, their state of health and the best method of orthodontic treatment.

In cases in which anomalous teeth are present, to differentiate betwen anomalous and normal teeth. In a majority of instances this can be done without the aid of the roentgenogram unless the teeth in question have failed to erupt; and in this instance the roentgenogram clears up the diagnosis.

The Therapeutic Spectrum. E. N. Kime and K. D. Ayers, Am. J. Phys. Therapy, 5:112-114, June, '28.

Modern physical therapy is based upon an accurate knowkdge of biophysics is objective rather than subjective, and definite indications and contra-indications exist.

The indications are those wherein the various physical agencies heat, light and those prviding graduated physiological exercise, are utilized either alone or in conjunction with other orthodox medical and surgical mthods.

Accurate diagnosis is essential. Sufficient time and attention should be given each patient to determine what is wrong, and how it can best be corrected.

Contra-indications depend upon: (1) The nature of the lésion. If a clear cut medical or surgical indication exists physical therapy is contra-indicated. (2) The variety of energy available and the state of efficiency of the electrical equipment. (3) The experience of the operator.

No one other than a duly qualified physician should be permitted by law to prescribe physiotherapeutic measures.

Stricture of the Ureter. W. F. Braasch, J. A. M. A. 91:1263-1268, Oct. 27, '28.

The incidence and the significance of pathologic involvement of the ureter has not been generally appreciated until within the last few years.

Stricture of the ureter occurs more frequently than has been recognized, but not as frequently as some observers are inclined to believe.

Recent contributions concerning lesions of the ureter are inadequate to give any accuratte idea of the incidence of stricture, as reported clinically. To determine this detailed examination of the ureters in at least 1,000 necropsies of a general hospital will be necessary.

The existence of so-called wide stricture is not substantiated by pathologic evidence.

Subjective symptoms and abdominal palpation are quite inadequate and misleading for diagnosis of stricture. Because of anatomic variations in the caliber of the ureter, the bulb method of diagnosis is quite unreliable. Urolography affords the best method of diagnosing stricture but such examination entails experience in interpretation and accurate technic.

Dilating the ureter in cases in which there is definite evidence of nontuberculous stricture of the ureter is a justifiable procedure and frequently tthe results are excellent.

Atonic dilatation of the ureter is more common and is of much greater clinical significance than has been recognized, and when present it is usually not benefited by dilation.

Spasm of the ureter frequently offers a logical hypophysis in explaining obscure symptoms referable to the urinary tract. It usually occurs if patients are suffering from various functional disturbances without apparent organic basis.

Instrumental dilation, when employed in the treatment of ureter spasm or as a counterirritant, should be regarded as a method of physical therapy.

Repeated and long continued dilations of the ureter, particularly when the urogram does not show evidence of abnormality, is to be deplored.

The Early Diagnosis of Malignant Disease of the Urinary Tract. J. D. Barney, New England J. Med. 199:281-283, Aug. 9, '28.

A complete physical examination should be done at least once a year on every individual, male or female, especially after the fortieth year. This should include among other things rectal or vaginal examination, a study of the urinary sediment and roentgenograms of the chest and abdomen. If pathological elements, especially blood, are found in the urine and if these persist for any length of time, a cystoscopy should be done to determine their source. This suggestion is doubtless impractical for one reason or another, but it does not seem to be too great a burden for the individual to bear when by it his life might be saved of prolonged.

Hematuria is by far the commonest symptom and often the earliest symptom of malignant disease of the urinary tract. It may be microscopic or macroscopic. It may not reappear for weeks or months. It cannot be influenced by medication. It is often disregarded or made light of. Its source and cause should be searched for without delay.

Pain is not an outstanding feature of the subject under discussion. It occurs, generally, at a late stage in the disease, and is frequently experienced at a point remote from the organ primarily involved, as a result of metastases.

Metastases from malignant disease of the prostate occur early and often, from the kidney less early and less often, and from the bladder late and seldom.

Except in neoplasms of the kidney the diagnosis can rarely be made by finding a tumor.

Cancer attacks the prostate in about one-fifth of all cases of prostatic obstruction. It may give rise to no urinary symptoms whatever.

Early diagnosis of malignant disease of the urinary tract is made with disappointing frequency. This is often due to the fact that it causes no demonstrable symptoms until the disease is well advanced. It has, therefore been necessary to speak of late symptoms as early symptoms in the sense that they were the first to appear.

Some Malformations of the Uterus. M. S. Sichel, Minnesota Med. 11:474-477, July, '28

Two cases of uterus bicornis unicollis with full term pregnancy necessitating manual removal of the placenta are presented.

One case of uterus septus unicollis removed at operation is presented.

One case of uterus bicornis unicollis visualized by lipiodol injection is shown.

The future possibility of making more accurate and earlier diagnosis of bicornate uteri and other associated anomalies by lipiodol injection is suggested.

The complications of the bicornate uterus usually occur mainly at the time of delivery and in the third stage. These should be watched for and treated accordingly; caesarean section should only be done when definitely indicated; manual removal of the placental should be resorted to whenever marked uterine hemorrhage with retention of the placenta occurs and after other methods have failed.

Laryngeal Tuberculosis. E. A. Looper and L. V. Schneider, J. A. M. A. 91:1012-1018, Oct. 6, '28.

Tuberculosis of the larynx is secondary to tuberculosis of the lung. The condition is an evidence of a general lowered resistance.

Sputum is the most common cause of laryngeal infection, but organisms may enter by way of the lymph and the blood stream.

A thorough examination of the larynx should be made in all cases of tuberculosis, as soon as recognized.

Slight congestion, dryness and tickling sensations of the larynx should promptly receive attention, as such symptoms often indicate early invasion of the larynx.

Laryngeal tuberculosis occurs at every age of life but the majority of cases are found between twenty and forty years of age, with males predominating.

Laryngeal tuberculosis has no relation to occupation.

Many cases can be prevented to a certain extent by the correction of pathologic conditions in the upper respiratory tract, such as deviated septum sinsitis, adenoids, hypertrophied turbinates and hypertrophied tonsils.

Nontuberculous laryngitis, colds, tonsilitis and excessive coughs in tuberculous patients should receive prompt attention, as conditions leading to superficial loss of epithelium open the way for infection by the sputum.

The frequency of involvement of various parts of the larynx is directly proportional to exposure, irritation and functional activity.

Laryngeal tuberculosis has never been a promising field for medicinal therapy regardless of the method of treatment. Many different drugs have been used and many local applications have been tried, most of which have been abandoned, especially caustics and irritants.

The results of cautery treatments used sporadically in the Maryland Sanatorium until August, 1923, were so impressive and encouraging that we felt its continued and increasing use was our best form of treatment.

Of all our patients with laryngeal lesions with moderate lung involvement treated by electrocautery, 65.5 per cent were improved and healed, and 26.5 per cent with far advanced lung involvement were improved and healed.

In the Maryland Sanatorium we did not have any "unimproved" patients treated with cautery in the moderately advanced group.

Cautery treatment in many patients exercised a favorable influence of the lungs and on the general condition. No bad results were encountered.

Cauterization in all patients has been done under local anesthesia by the indirect method at monthly intervals.

Results obtained by electric cautery treatment indicate without doubt that tuberculosis of the larynx is curable if started reasonably early.

In all suggestive cases we advise vocal rest or silence. While active laryngeal tuberculosis does not have any tendency toward spontaneous healing, it is surprising with what rapidity some incipient cases with slight infiltration will clear up as the result of absolute silence. Therefore, regardless of whatever method of treatment is added, silence is imperative in all cases.

The electric cautery seems likely to supersede all other procedures and enjoys at present the increasing recognition as the best method of treatment of laryngeal tuberculosis.

The revitalization of the tissues by induced hyperemia and the development of granulation tissue with formation of new blood vessels accounts for the good results obtained by the cautery.

Elevation of temperature (high degrees), marked asthenia and high blood pressure are contra-indications in using the cautery, although in patients in whom serious symptoms (severe pain, difficulties in swallowing) demanded alleviation, we did use the cautery to bring temporary relief.

In using the electrocautery, one thing should be particularly and strongly emphasized and that is the conditions of the lungs. No laryngologist should undertake electrocautery treatment without co-operating with or being guarded with a clinician. Indiscriminate use of the cautery in unsuitable cases will do more harm than good and the method of treatment itself will be brought into disrepute.

Use and Abuse of Radium. E. M. Daland, New England J. Med., 198:1005-1006, June 28, '28.

Radium should not be used where surgery is possible. It should not be employed unless all parts of the lesion can be reached, otherwise the growth cannot be checked. Cancer of the cervix uteri according to statistics is not successfully treated by radium. Cancers of the metastisizing types should not be treated until the glands are properly treated.

The employment of radium requires skill by the man applying it or much harm may be done by its use in the wrong type of cases and giving over doses.

Chronic Gastric and Duodenal Ulcer. B. W. Seaman, Long Island M. J. 22:629-632, Nov., '28.

A relatively high percentage of cures of chronic peptic ulcer can be obtained by surgical methods.

If the case of acute perforation, hemorrhage and those which degenerate into malignancy be classed as medical, then the mortality will be found higher than in the surgically treated ones.

It is fully realized that the series used for this paper is far too small to draw infallible conclusions from, still the comparative study betwen it and many larger series, brought to my attention much valuable information on the subject of chronic peptic ulcer.

X-ray pictures should be taken as a confirmatory measure in all cases.

The Treatment of Carcinoma of the Uterus. O. N. Meland, M. D., Radiol. Rev. & Chicago M. Rec., 50:390-391, Oct., '28.

The results of the treatment of cancer of the uterus with radium was so favorable that the gynecologists of Sweden, in 1920 turned over all of their cervical carcinoma cases to Radium Hemmet for treatment. In 5,806 cases of cancer of the cervix collected from world literature, the absolute cures at the end of of five years were 20.2 per cent. Forty three per cent of this number were operable, therefore the relative curability was 35.6 per cent.

The survey as far as Radium Hemmet is concerned shows that radiation is far superior to surgery in both cervical and fundus carcinomas. Statistics reported from surgerical results are based on patients with a relatively high operability while those reported from radiation treatments shows many cases that are so far advanced that the operable cases are in the minority.

Multiple Furunculosis in Infancy with Special Reference to Ultraviolet Ray Therapy. M. L. Blatt, M. D., Radiol. Rev. & Chicago M. Rec., 50:388-389, Oct., '28.

Furunculosis is frequently a severe complication and often a terminal infection in young infants.

It necessitates serious time consuming treatment. The ultraviolet rays used both locally and generally in these cases is a valuable adjuvant to surgical drainage and distinctly lessens the number of crops and number of new lesions.

Cancer Irradiation with Cathode Rays. M. F. Guyer and F. Daniels. J. Cancer Research, 12:166-187, June, '28.

It is evident that with tumors not too far advanced cathode rays have a specific detrimental effect on the tumor tissue of the variety used.

The beneficial effects of the rays are generally confined to the earlier treatments. Successive rayings after the initial improvement seems to be more injurious than otherwise. A single long exposure appears to yield the best result. The most curative treatment was found to be a one-minute exposure at a distance of 2 ccm. with a voltage of 140 K. V. and a space current of 1.4 milliamperes.

The penetration of the effective rays into living cancers, as shown by transplanting tumor fragments taken at different depths, was at most 0.5 cm. However, rays passed through a slice of ordinary boiled ham only 1 mm. thick did not kill paramecia in 130 seconds, although without this flesh screen, with the same physical set up such paramecia were killed in 4 seconds. Pieces of lime which glowed brilliantly when rayed directly, showed only a faint glow when rayed through the 1 mm. flesh screen.

The lethal exposure for Drosophila eggs rayed on moist filter paper is 0.5 seconds or less under the conditions of these experiments.

Cathode rays injure skin tissue when applied directly to it but apparently do not produce malignant growth.

The lethal exposure for a normal rat rayed an the belly over a circular area 2.5 cm. in diameter (voltage 140 K. V.; space current, 1.4 ma; distance, 2 cm.) is three or more minutes.

Areas of the belly when given standard treatment are rendered immune to immediate tumor transplants, although they become susceptible as they begin to heal.

The treatment of one tumor does not affect another tumor in the same animal. The action of cathode rays on tumor is direct, therefore, not systemic.

Work with targets, intended to test the effects of x-ray spectra of various metals as well as the effects of soft x-rays, were unsuccessful, due possibly, however, to the unsatisfactory physical set-up.

Chronic Duodenal Ileus. C. H. Jewett, J. A. M. A., 91:91-95, July 14, '28.

The patients in this group were mostly women in middle age of the asthenic habitus who gave a history of long and indefinite gastro-intestinal disturbance. Loss of weight often accompanied the occurrence of more severe symptoms and a history of recurring so-called bilious attacks was rather frequent, but there was no definite symptom complex by which the condition could be recognized. The diagnosis was made in each instance by roentgen ray examination. Medical treatment has given good results except in cases of marked obstruction in which surgery seemed indicated from the outset. More frequent roentgen ray study of the patient with chronic gastro-intestinal disturbance will undoubtedly reveal a higher percentage of cases of this type.

JAN 3 1929

VOLUME IX DECEMBER, 1928 NUMBER 12

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